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NATIONAL INSTITUTE OF ARTHRITIS, METABOLISM, AND DIGESTIVE DISEASES

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VOLUME 9, NO. 10
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Volume 9 No. 10

Abstract and Citation Nos. 5197-6593

GASTROENTEROLOGY ABSTRACTS AND CITATIONS

A monthly publication of the
National Institute of Arthritis, Metabolism, and Digestive Diseases

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by
The Franklin Institute Research Laboratories
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Bruce H. Kleinstein, Ph.D., Technical Editor
for the
National Institute of Arthritis, Metabolism, and Digestive Diseases
pursuant to Contract Number N01-AM-4-2204
with the PHS, USDHEW

DHEW Publication No. (NIH) 76-66

PREFACE

GASTROENTEROLOGY ABSTRACTS and CITATIONS is a publication of the National Institute of Arthritis, Metabolism and Digestive Diseases. This specialized information medium has been initiated to fill an existing great need in the field of gastroenterology and to assist the Institute in meeting its obligations to foster and support laboratory and clinical research into the nature, causes, and therapy of diseases of the gastrointestinal tract. Publication GASTROENTEROLOGY ABSTRACTS and CITATIONS makes available citations of all current papers relevant to this field from medical journals published throughout the world. Approximately one-third of the citations dealing with the major aspects of gastroenterology have accompanying abstracts.

The issuing of GASTROENTEROLOGY ABSTRACTS and CITATIONS under the auspices of the National Institute of Arthritis, Metabolism, and Digestive Diseases will provide a much needed current awareness tool to scientists and will facilitate greater integration of research and clinical efforts in this field. The number and great diversity of publications in the area of gastroenterology makes it imperative that an appropriate service be available to investigators and practitioners so that they may be apprised of progress with a minimum of delay. Our aim is to provide the readers with a readily systematized compilation of current published work. The publication will provide the greatest usefulness if these interested investigators will contribute their ideas and comments for consideration whenever possible.

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The Secretary of the Department of Health, Education, and Welfare has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through April 30, 1975.

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NOTE

Journal names are abbreviated according to the list of abbreviations used by *Index Medicus*. For journals not covered by *Index Medicus*, the abbreviations (with some modifications) found in *World Medical Periodicals*, 3rd Edition, are used.

LANGUAGE ABBREVIATIONS

Afr.	Afrikaans
Ar.	Arabic
Bul.	Bulgarian
Ch.	Chinese
Cz.	Czech
Dan.	Danish
Dut.	Dutch
E.	English
Eston.	Estonian
Fin.	Finnish
Fl.	Flemish
Fr.	French
Ger.	German
Gr.	Greek
Heb.	Hebrew
Hun.	Hungarian
Ic.	Icelandic
In.	Indonesian
It.	Italian
Jap.	Japanese
Kor.	Korean
Latv.	Latvian
Lith.	Lithuanian
Nor.	Norwegian
Pol.	Polish
Por.	Portuguese
Rum.	Rumanian
Rus.	Russian
Ser.	Serbo-Croatian
Sl.	Slovak
Sp.	Spanish
Sw.	Swedish
Th.	Thai
Turk.	Turkish
Uk.	Ukrainian
Viet.	Vietnamese

ABBREVIATIONS USED IN ABSTRACTS

ACTH	adrenocorticotropic hormone
ADP	adenosine diphosphate
AMP	adenosine monophosphate
amp	ampere
ATP	adenosine triphosphate
Å	angstrom
BSP	sulfobromophthalein
C	degrees centigrade
cal	calories
cc	cubic centimeter
cm	centimeter(s)
dl	deciliter
DNA	deoxyribonucleic acid
ED_{50}	median effective dose(s)
EDTA	ethylenediamine tetraacetic acid
e.g.	for example
EEG	electroencephalogram
ESR	erythrocyte sedimentation rate
g	gram(s)
μg	microgram(s)
Hz	Herz
hr	hour(s)
i.m.	intramuscular
i.p.	intraperitoneal
IU	international unit(s)
i.v.	intravenous
kcal	kilocalorie(s)
kg	kilogram(s)
K_m	Michaelis constant
LD_{50}	median lethal dose(s)
LDH	lactic acid dehydrogenase
m	meter(s)
M	molar; mole(s)
mM	millimolar; millimole(s)
μM	micromolar; micromole(s)
ma	milliampere(s)
mCi, μCi	milli-, microcurie(s)
mEq	milliequivalent(s)
mg	milligram(s)
ml, μl	milli-, microliter(s)
mm	millimeter(s)
mOsm	milliosmolar; milliosmeter(s)
msec	millisecond(s)
mV	millivolt(s)
min	minute(s)
MTD	maximum tolerated dose
NAD	nicotanamide adenine dinucleotide
NADH	reduced nicotanamide adenine dinucleotide
NADP	nicotanamide adenine dinucleotidephosphate
NAPH	reduced nicotanamide adenine dinucleotidephosphate
ng	nanogram (10^{-9})
nm	nanometer(s)
Pa	ambient pressure
PAS	periodic acid — Schiff
pg	picogram (10^{-12})
pgEq	picogram equivalent(s)
p.o.	orally
ppb	parts per billion
ppm	parts per million
r	Roentgen
RBC	red blood cells (erythrocytes), red blood count
resp.	respectively
RNA	ribonucleic acid
s.c.	subcutaneous
sec	second(s)
SGOT	serum glutamic-oxalacetic transaminase
SGPT	serum glutamic-pyruvic transaminase
U	unit(s)
UV	ultraviolet
V	volt
WBC	white blood cells (leukocytes), white blood count
yr	year(s)

PRE-CLINICAL SCIENCES

MORPHOLOGY, CELLULAR STRUCTURE AND HISTOCHEMISTRY

5197 EFFECT OF TRASYLOL® ON PANETH CELLS OF THE MOUSE. *(E.)* Ahonen, A.; Penttila, A. (Dep. Anat., Univ. Helsinki, Finland). *Experientia* 31(5):577-578, 1975.

The morphological effects of Trasylol^{R}, a trypsin and proteinase inhibitor, were studied in intestinal Paneth cells. Mice were fasted for 1 day, but received water *ad libitum*. Ten mice received an i.p. dose of 40,000 IU/kg Trasylol and seven controls received an equal dose of 0.9% saline solution. The animals were decapitated 1 hr later. Tissue samples from the mid-duodenum and mid-jejunum were formalin-fixed, paraffin-embedded, sectioned (7 μm) and stained with Best's carmine. The number of cytoplasmic coarse granules of Paneth cells was counted under a light microscope (400 cells from the experimental animals and 600 from the controls were studied). The number of identifiable Paneth cells in an intestinal crypt was higher in Trasylol-treated mice than in controls 1 hr after injection; the mean diameter of Paneth cells was also higher. There was a highly significant increase in the mean number of secretory granules/cell; from 12.1 to 17.1 in the duodenum, and from 8.3 to 19.7 in the jejunum. The inhibitory effect of Trasylol on Paneth cells is similar to the agents' effect on pancreatic acinar cells. It is suggested that the Paneth cells are morphologically, functionally and embryologically related to pancreatic acinar cells, and that the underlying mechanism for the increase of counts of secretory granules may result from delayed extrusion of the granules from the cell cytoplasm into the intestinal lumen.

5198 IDENTIFICATION OF THE INTESTINAL CELL STORING GASTRIC INHIBITORY PEPTIDE. *(E.)* Buffa, R.; Polak, J. M.; Pearse, A. G. E.; Solcia, E.; Grimelius, L.; Capella, C. (Inst. Pathol. Anat., Univ. Pavia, Italy). *Histochemistry* 43(3):249-255, 1975.

A recently-described intestinal endocrine cell was studied to determine its possible role in the production of gastric inhibitory peptide. Small intestinal mucosa samples from man, pig and dog were subjected to sequential or correlative silver impregnation techniques, applied to immunocytochemical preparations and at the ultrastructural level. The cell reacting with antigastric inhibitory peptide sera was identified as the ultrastructurally classified K cell. It was recognized by strong reactivity with the Sevier-Munger staining procedure and was chosen as the peptide-producing cell, provided that the equally strong-reacting enterochromaffin cell was excluded by virtue of its argentaffinity with the Masson technique. It is proposed that the term "gastric inhibitory peptide cell" be used to designate the K cell.

5199 INFLUENCE OF GLUCOCORTICOIDS ON SOME MORPHOLOGICAL AND BIOCHEMICAL ASPECTS OF RAT SMALL INTESTINAL MUCOSA. *(E.)* Lafont, J.; Pilon, R. (Lab. Biochim. Proteins, Univ. Sci. Tech. Languedoc, Montpellier, France). *Biochim. Biophys. Acta* 392(2):288-298, 1975.

The effect of cortisone on the rat small intestine during the post-weaning period was studied using male and female SPF rats (28-30 days old), injected with hydrocortisone (0.02, 0.1, 0.5, or 5 mg/100 g daily) i.p. or s.c. for 3 or 8 days. In another experiment, rats were injected daily with 25 μg/100 g of ACTH for 4 days. (^{3}H)thymidine was injected i.p. 0.5-12 or 24 hr before killing and cell migrations and the protein and alkaline phosphatase contents of the small intestinal mucosa were measured after sacrifice. Hydrocortisone at 5 mg/100 g for 3 days resulted in a 30% reduction in body weight and a 28% reduction in the protein content of the intestinal mucosa compared with control values. No differences were found following administration of 0.5 mg/100 g hydrocortisone for 3 days or after the administration of 0.02 or 0.1 mg hydrocortisone/100 g for 8 days. Similarly, there were no changes in body weight or intestinal mucosal protein following ACTH administration. Hydrocortisone (5 mg/100 g) caused a marked reduction in the activities of maltase and alkaline phosphatase, while ACTH elicited a specific rise in the activities of these enzymes. The opposing effects of glucocorticoid treatment and corticotrophic treatment do not appear to depend on enzyme activation, membrane stabilization, or on modifications of proliferative parameters in the intestinal epithelium. Rather, they appear to derive from the same origin, e.g., the action of glycocorticoids on the enterocyte differentiation.

5200 CHANGES IN INTESTINAL CELL KINETICS IN THE SMALL INTESTINE OF LACTATING MICE. *(E.)* Harding, J. D.; Cairnie, A. B. (Dep. Biol., Queen's Univ., Kingston, Canada). *Cell Tissue Kinet.* 8(2): 135-144, 1975.

Alterations in the proliferative characteristics of the epithelium of the mouse small intestine during lactation were studied. Virgin, pregnant (sixteenth day), lactating (fifteenth day) with 8 pups, and 15-day parous but nonlactating Swiss Webster mice were injected i.p. with ^{3}H-thymidine and, in some cases, with ^{14}C-thymidine prior to sacrifice. The number of crypts and villi in the jejunum and ileum were determined, as was the percentage of labeled mitoses. As compared with the virgin mice, the small intestine in the lactating mice was increased in size and weight. The turnover time of nonproliferating, postmitotic cells was similar in the virgin and lactating mice, as was the number of crypts. However, there was a small increase in crypt cell number in the pregnant mice and a larger increase in the lactating females (130%

increase) as compared with the virgin females. The number of crypt cells incorporating tritiated thymidine was also increased during lactation and there was evidence that the intestinal proliferating cells were cycling slightly faster in the lactating mice. The number of proliferating cells/crypt in the lactating mice was increased by 63% over the number seen in the virgin animals. Food consumption increased slightly over control levels during pregnancy and increased considerably during lactation. Lactating females in which food consumption was restricted to control levels showed increases in intestinal wet weight and intestinal crypt cell number, but the increases were smaller than those seen in lactating females fed *ad libitum*. The results suggest that food consumption, the hormonal state of the mother, and the metabolic demands of lactation all contribute to the intestinal hyperplasia seen in the lactating mouse.

5201 NEURAL STIMULATION OF MITOTIC ACTIVITY IN THE CRYPTS OF LIEBERKUHN IN RAT JEJUNUM.

(E.) Tutton, P. J. M. (Dep. Anat., Monash Univ., Victoria, Australia). *Cell Tissue Kinet.* 8(3):259-266, 1975.

The influence of nerve stimulation and sham-stimulation on the mitotic rate of the epithelial cells lining the crypts of Lieberkühn in the jejunum of anesthetized male Sprague-Dawley rats was studied. Administration of the anesthetic (pentobarbitone sodium) and opening of the abdominal cavity were without significant effect on the crypt cell mitotic rate, which was measured 1-4 hr following the i.p. administration of cholchicine (0.1 mg/kg). Neural stimulation involved the passage of electrical current through the mesenteric nerves of an externalized loop of jejunum, while sham-stimulation involved placing the electrodes on the neurovascular bundle of the loop without passing current through them. These procedures were carried out in normal rats and in rats which had been chemically sympathectomized 3 days previously by the injection of 6-hydroxydopamine at a dose of 100 mg/kg. Externalization of a jejunal loop and application of sham-stimuli to its mesenteric nerves resulted in a significant decrease in the crypt cell mitotic rate in that loop, while the application of electrical stimuli resulted in a significant increase in the mitotic rate in the crypt cells of that segment. Similar acceleration of crypt cell proliferation by electrical stimuli applied to the mesenteric nerves was also seen in the chemically sympathectomized rats. Although the nature of the nonadrenergic nerves mediating this response is unknown at present, acetylcholinergic, serotoninergic, and/or histaminergic nerves may be involved.

5202 A REGION OF MITOCHONDRIAL DIVISION IN THE EPITHELIUM OF THE SMALL INTESTINE OF THE RAT.

(E.) Jeynes, B. J.; Altmann, G. G. (Dep. Anat., Univ. West. Ontario, London, Canada). *Anat. Rec.* 182(3):289-296, 1975.

Ultrastructural details and mitochondrial concentrations in various regions of the small intestines of adult male Wistar rats were studied by electron microscopy. Intestinal samples were removed immediately after sacrifice at the levels of the duodenum, the jejunum and the proximal, mid, and distal ileum. Similar segments were taken from animals perfused with 3% glutaraldehyde, from animals given methotrexate (5 mg s.c. followed by 1-3 days dietary intake of 5 mg) and from animals in which the jejunum had been surgically isolated 3 weeks previously. In the control animals, the average mitochondrial number/cell section was 21 in the lower third of the crypts; it then gradually increased in the mid and upper thirds of the crypts, reaching about 42 at the villus base and remaining constant along the epithelium of the villi. The known forms of dividing mitochondria were identified in the mid and upper third of the crypts; these figures were rarely observed in the lower crypt and never seen on the villus. Crypt cells were continually produced in the lower crypt. These cells migrated to the villi while differentiating into nonproliferative absorptive cells. After methotrexate-induced mitotic inhibition, this migration continued and mitochondrial division persisted, although cell morphology was greatly changed by the third day of treatment. In segments of the jejunum isolated surgically from the functional intestine for 3 weeks, mitosis and cell migration continued, but no evidence of mitochondrial duplication was found. The results suggest that each mitochondrion probably undergoes a division as the crypt cells migrate from the mid-crypts to the villus. As a result, the villus epithelial cells contain double numbers of mitochondria. The mitochondrial division does not appear to be directly related to mitosis and is apparently elicited by a stimulus present only in the functional intestine.

5203 EARLY LYMPHOEPITHELIAL RELATIONSHIPS IN HUMAN APPENDIX: A COMBINED LIGHT- AND ELECTRON-MICROSCOPIC STUDY.

(E.) Bockman, D. E.; Cooper, M. D. (Med. Coll. Ohio, Toledo). *Gastroenterology* 68(5):1160-1168, 1975.

The relationship between the developing lymphoid follicles and epithelium in the appendix of human fetuses and children was examined by light and electron microscopy. Appendices were obtained from nine apparently normal fetuses, one stillborn child, and five children ranging in age from 5 months to 8 yr. Follicular accumulations of lymphocytes were observed first in the mesenchyme of an 11.5-cm fetus immediately beneath the epithelium, which contained a predominance of goblet cells on the surface and in the crypts. Larger accumulations of lymphoid cells in older fetuses (15 cm and larger) were intimately related to the surface epithelium but not to the epithelium of the crypts. At the point of invasion of the lymphoid cells into the surface epithelium, the goblet cell population diminished and epithelial cells displaying a morphologically distinct form of differentiation were observed. They were characterized by the presence of irregular microvilli or microfolds and numerous apical micropinocytotic vesicles. This follicle-associated epithelium (FAE) appeared ultrastructurally identical with the epithelium in the chicken bursa of Fabricius, the murine Peyer's patch and the rabbit appendix, which has been shown to be capable of transporting ferritin and India ink tracer from the lumen to underlying tissue. The FAE also appeared identical to the specialized epithelial cells of the adult human Peyer's patches. No FAE was observed in the youngest fetuses (11.5 cm and less), but was maintained throughout the later neonatal period into childhood. It is suggested that the FAE may provide a channel through which antigens may stimulate clonal proliferation and seeding of B-lymphocytes throughout the lamina propria of the internal mucous surfaces.

5204 CYTOCHEMICAL LOCALIZATION OF ADENYL CYCLASE IN THE RAT COLONIC MUCOSA. *(E.)* Corriveau, M.; Rojo-Ortega, J. M. (Clin. Res. Inst. Montreal, Canada). *Virchows Arch. Zellpathol.* 18(2):129-134, 1975.

The cellular distribution of adenyl cyclase was studied at the ultrastructural level in the rat colonic mucosa. Segments of the ascending and descending colonic mucosa of adult male Sprague-Dawley rats were incubated in medium containing 4 mM lead nitrate. The lead ions caused precipitation of the pyrophosphate formed by adenyl cyclase reacting with adenylylimidodiphosphate in the incubation medium. By this method, adenyl cyclase activity was localized in the brush border of the epithelial cells of the surface epithelium of the ascending colon. In the descending colon, coarse precipitates were located mainly in the basement membrane, in the junctional areas between epithelial cells, and on the brush border of all epithelial cells. Hydrolysis of the substrate was accelerated by the addition of 10 mM sodium fluoride to the incubation medium. The results suggest that the adenyl cyclase present in the basement membrane, plasma membrane, and in the brush borders may play a role in the regulation of intestinal transport. They also suggest that the colonic membrane may play a more crucial role in intestinal regulation than that of a simple filtration barrier.

5205 SMALL INTESTINAL MUCOSAL INJURY IN THE EXPERIMENTAL BLIND LOOP SYNDROME: LIGHT- AND ELECTRON-MICROSCOPIC AND HISTOCHEMICAL STUDIES. *(E.)* Toskes, P. P.; Giannella, R. A.; Jervis, H. R.; Rout, W. R.; Takeuchi, A. (Dep. Hematol., Walter Reed Army Inst. Res., Washington, D.C.). *Gastroenterology* 68(5):1193-1203, 1974.

The morphological integrity of the small intestine was investigated by light and electron microscopic and histochemical methods in male Walter Reed Carworth Farms rats with the experimental blind loop syndrome. Three groups of animals were studied: normal control animals and animals with either self-filling (SF) or self-emptying (SE) jejunal blind loops constructed surgically 10 cm distal to the ligament of Treitz. The blind loop segment and the jejunal segments proximal and distal to the blind loop were examined. Vitamin B_{12} malabsorption and bacterial overgrowth occurred only in the animals with SF blind loops, the most striking findings occurring in the blind loop itself with similar but less marked changes in the jejunum distal but not proximal to the blind loop segment. Hypertrophy of both crypts and villi was evident with focal abnormalities of the villus architecture, approximately 10-20% of the columnar cells in the upper half of the villi being swollen and vesiculated. By electron microscopy, the microvilli demonstrated a variety of degenerative changes and the glycocalyx and terminal web were disrupted. In addition, the mitochondrial and endoplasmic reticulum (ER), both smooth and rough, were swollen and concentric whorls of parallel membranes and long, curvilinear rough ER were present in the cytoplasm. Histochemically, there was loss of enzymatic activity in the epithelial brush border, mitochondria, and ER. Inasmuch as bacterial invasion of the jejunal mucosa was not seen, the etiology of these changes is unknown but may involve bacterial "toxins" or products of bacterial metabolism. These morphological observations demonstrate that both brush border and intracellular injury occur in the jejunal epithelial cells of rats with the experimental blind loop syndrome.

5206 FLUORESCENCE HISTOCHEMISTRY OF THE GASTRIN CELL IN FETAL AND ADULT MAN. *(E.)* Larsson, L. I.; Hakanson, R.; Sjoberg, N. O.; Sundler, F. (Dep. Histol., Univ. Lund, Sweden). *Gastroenterology* 68(5):1152-1159, 1975.

The histochemical properties of cells within the antral and duodenal mucosa and pancreatic islets which show gastrin immunoreactivity were compared in material from fetal and adult humans. Material from the adult and fetal antropyloric mucosa and proximal duodenal mucosa and adult pancreas were exposed to formaldehyde gas-ozone treatment or formaldehyde gas-hydrochloric acid treatment and examined using immunohistochemical techniques and fluorescence microscopy. Immunoreactive gastrin cells were demonstrated in both the adult and fetal duodenal mucosa and in the adult antropyloric mucosa; only a few scattered gastrin cells were detected in the antral mucosa of fetuses of 19-20 weeks gestation, but these cells were present in large numbers in the antral mucosa of two stillborn infants. No gastrin immunoreactivity was seen in the pancreatic islets. The antral and duodenal gastrin cells, as well as the pancreatic A_2-cells, displayed strong formaldehyde-ozone- and formaldehyde-HCl-induced fluorescence, whereas the pancreatic A_1-cells (previously claimed to store gastrin) were nonfluorescent. The fluorescence histochemical properties of the fetal gastrin cells did not differ from those of the adult material. The results suggest a relationship between immunoreactive gastrin and a postulated peptide having NH_2-terminal tryptophan.

5207 DIRECT EFFECTS OF ENDOTOXIN ON CANINE GASTRIC MUCOSAL PERMEABILITY AND MORPHOLOGY. *(E.)* Cheung, L. Y.; Stephenson, L. W.; Moody, F. G.; Torma, M. J.; Zalewsky, C. (Univ. Utah Med. Cent., Salt Lake City). *J. Surg. Res.* 18(4):417-425, 1975.

The direct effects of endotoxin on canine gastric mucosal permeability and morphology in the absence of arterial hypotension were evaluated. Male and female mongrel dogs were anesthetized and the fundic section of the stomach was removed and placed in a single- or double-lumened Leucite chamber. Mucosal bathing solutions of isotonic HCl and isosmotic mannitol were used singly in the single chamber experiments and together, one in each chamber, in the double chamber experiments. *E. coli* endotoxin (0.1 ml/min) was infused continuously into the artery supplying the chambered gastric segment; during control periods, normal saline was infused. Endotoxin infusion produced a profound change in the mucosal appearance, from bright, uniform red during the control periods to mottled, pale-white during endotoxin infusion. Gross erosions occurred in 4/13 mucosae bathed with 0.15 N HCl within 1 hr of infusion of endotoxin in the absence of arterial hypotension. Histological changes seen in most experiments included a release of mucus from the surface epithelial cells and elevation of the epithelium from the basement membrane. In more advanced lesions, severe injury extended into the gastric glands and surrounding connective tissue with cellular necrosis. In spite of gross and microscopic gastric mucosal injury, no significant change was seen in hydrogen ion back diffusion or sodium efflux. These observations suggest that gastric mucosal injuries can occur in endotoxemia without systemic arterial hypotension and that anatomical mucosal injuries are not associated with the destruction of the hydrogen-sodium permeability barrier.

5208 CYTOTOXICITY OF VINBLASTINE AND VINCRISTINE TO PANCREATIC ACINAR CELLS.

(E.) Nevalainen, T. J. (Dep. Pathol. Anat., Univ. Turku, Finland). *Virchows Arch. Zellpathol.* 18(2):119-127, 1975.

The effects of the Vinca alkaloids vinblastine and vincristine on the ultrastructural integrity of the murine exocrine pancreas cells were studied. Vincristine (20 mg/kg) or vinblastine (40 or 200 mg/kg) dissolved in saline was given as a single i.p. injection to male and female BALB/c mice; nontreated mice served as controls. The animals were killed 1, 3, 5, or 24 hr or 4 days after drug treatment and small pieces of the pancreas were prepared for electron microscopic examination. Fatty liver was found in all animals within 24 hr after treatment with either drug, and there were scattered foci of cell necrosis within 24 hr and marked loss of acinar cells and pancreatic atrophy within 4 days after drug administration. In animals killed after 1 hr, the acinar cells were slightly swollen and some areas of the rough endoplasmic reticulum were vesiculated. The number of autophagic vacuoles in the acinar cells increased progressively between 3 and 5 hr after treatment, the Golgi apparatus being hypertrophied at these times. Mitochondria and portions of the rough endoplasmic reticulum were identified within the autophagic vacuoles. The zymogen granules appeared normal but were decreased in number. These changes were more pronounced after 24 hr and 4 days, necrotic and disintegrating acinar cells being found at both times. It is concluded that the vinca alkaloids caused autophagy and degeneration in the pancreatic acinar cells and that their inhibitory effect on pancreatic enzyme secretion might depend partly or solely on their cytotoxic action.

5209 MORPHOLOGICAL EFFECTS OF INTRAPERITONEAL OILY FATTY ACIDS ON THE INTESTINE AND PERITONEUM OF RATS.

(E.) Wagner, R.; Oehlert, W. (Dep. Pathol., Univ. Freiburg, Germany). *Beitr. Pathol.* 154(3):281-292, 1975.

The effects of the administration of oily fatty acids on the intestinal mucosa was studied in 133 rats. Sesame oil DAB 6 was injected i.p. daily in amounts of 3.3 ml/kg and 6.6 ml/kg; 43 received 3.3 ml/kg p.o. The rats were sacrificed at various time intervals, blood samples were taken, and tissues were prepared for histologic study. Other groups of rats received single i.p. injections of 5 ml, 10 ml, or 20 ml sesam oil; four rats received 3 ml daily for 5 days. They were sacrificed on various days from day 1 to day 75. No pathological changes were found in animals treated p.o. After 68-100 days of continuous daily i.p. injections, changes in the small intestinal mucosa were observed: structural villous alterations with shortening, broadening and fusion of villi, fatty vacuolization of epithelia, dilation of lymphatics and mesenchyme activation of the villous stroma with occurrence of large, PAS-positive histiocytes. The most impressive structural changes resulted from long-term low dosage or short-term high dosage of oil. The results suggest that the oil-induced granulomatous proliferative-inflammatory process of the peritoneum could be regarded as a precursor and mediator of the changes, and that absorptive overload of the peritoneum and overcharge of the mesenteric lymph drainage are pathogenic factors in the development of mucosa alteration leading to disturbed villous microcirculation and insufficient supply to the enterocytes.

5210 PERIBILIARY PORTAL SYSTEM IN THE MONKEY LIVER AS EVIDENCED BY THE INJECTION REPLICA SCANNING ELECTRON MICROSCOPE METHOD.

(E.) Murakami, T.; Itoshima, T.; Shimada, Y. (Okayama Univ. Sch. Med., Japan). *Arch. Histol. Jpn.* 37(3): 245-260, 1974.

The peribiliary plexus and its efferent vessels in the monkey liver were studied using a method consisting of plastic casting and scanning electron microscopy combined with microdissection. The methyl methacrylate blood vascular casts of a male rhesus monkey liver and the kidney of a male crab-eating monkey were used. It was demonstrated that the peribiliary blood vascular plexus received the afferent vessels from the hepatic artery and emitted the efferent vessels directly draining into the hepatic sinusoids. The study also confirmed that the route to the sinusoids *via* the peribiliary plexus is completely isolated from the route of the portal vein as well as the arterial pathway to the sinusoids. The findings support the classical view of the "radicular portal veins" and show that the efferent vessels of the peribiliary plexus are distributed as if they cover deficiencies of the portal supply to the sinusoids.

5211 MACROMOLECULAR CONFORMATION OF THE COLON MUCUS AS REVEALED BY DETECTION OF ANISOTROPIC PHENOMENA. *(E.)* Vidal, B. C.; Mello, M. L. S. (Inst. Biol., State Univ. Campinas, Brazil). *Ann. Histochim.* 19(2):151-156, 1974.

Macromolecular components of rat colon mucus were studied after staining with toluidine blue solution (pH 4.0) and anisotropical phenomena were also investigated. The mucus was found to be metachromatic and displayed anisotropic phenomena; dichroism was visually observed, which was negative at wavelengths 490-620 nm. The anomalous dispersion of the birefringence showed an inflection point at a wavelength near that of the linear dichroism maximum; thus it was considered a Cotton effect-like phenomenon. The observations suggest a helical conformation for the acid mucopolysaccharides of the mucus and that structural conditions and/or patterns of molecular orientation of the acid mucopolysaccharides can vary in different tissues.

5212 PROLIFERATIVE PATTERNS IN THE MOUSE JEJUNAL EPITHELIUM AFTER FRACTIONATED ABDOMINAL X-IRRADIATION. *(E.)* Lesher, S.; Cooper, J.; Hagemann, R.; Lesher, J. (Allegheny Gen. Hosp., Pittsburgh, Pa.). *Curr. Top. Radiat. Res.* 10(3):229-261, 1975.

Cell proliferation was studied in the jejunal epithelium of mice exposed to fractionated abdominal x-irradiation. Lightly anesthetized male C57Bl/6J mice were exposed to x-irradiation at a dose level of 300 R; the upper portion of each animal was lead shielded. The radiation exposures were repeated 2, 4, 6, or 9 times, with intervals of 6, 12, 24, 48, or 96 hr separating the exposures. The crypt squash technique was used to measure labeled nuclei and mitotic figures/crypt 1-96 hr after the final exposure, and cell cycle times including estimates of G_1, S, G_2, and M were made 12 and 24 hr after the final exposure. The damage-repair-recovery pattern, i.e., increase in the size of the proliferative population and acceleration of the generation cycle, was similar after single (previous data) and fractionated exposures. However, there were quantitive differences between various fractionation regimens. Overshoot in labeled nuclei/crypt and mitotic figures/crypt following 2 or more exposures was less than after 1 exposure, and the G_2 block decreased as the number of fractions increased. The number of 300 R exposures which could be tolerated was dependent on the time interval between exposures. Total cell production through 9 successive exposures was estimated to be, in percent of controls, 15% (12 hr interval), 34% (24 hr interval), and 64% (48 hr interval). As a result, death followed depression of the total cell production to 15% of the control levels for 4 days (12 hr fractions), to 34% of control levels for 8 days (24 hr fractions), and to 64% of control levels for 16 days (48 hr fractions). Thus, both the degree and the duration of depressed proliferative activity are critical factors in the intestinal response to fractionated treatment. Because of its great potential for compensatory hyperplasia following injury, the intestinal epithelium is capable of recovery from extensive damage provided that critical levels of crypt depletion have not occurred and that sufficient time is allowed for the acceleration in proliferative activity. The compensatory recovery potential is maintained over a large number of exposures.

5213 STUDIES ON A FRACTION OF HUMAN GASTRIC MUCOSA CONTAINING INTRINSIC FACTOR ISOPROTEINS TYPICAL OF MUCOSA. *(E.)* Grasbeck, R.; Marcoullis, G. (Inst. Med. Res., Helsinki, Finland). *Scand. J. Clin. Lab. Invest.* 35(1):13-18, 1975.

A mucosal fraction containing isoproteins of the vitamin B_{12}-intrinsic factor complex with high isoelectric points (pH 5.05-6.52) was isolated from 15 resected stomachs. This fraction (B_{12}-N) was labeled with ^{58}Co-vitamin B_{12}, partially purified by DEAE-cellulose chromatography, and studied by electrofocusing, gel filtration, ultracentrifugation, immunologic procedures, and the Schilling test. The molecular weight of the fraction was about 2000 daltons smaller than gastric juice B_{12}-intrinsic factor. The fraction possessed immunological and biological intrinsic factor activity. When the purified B_{12}-N was mixed with antiserum from a patient with pernicious anemia and subjected to Sephadex G-150 filtration, the radioactivity was totally removed. After administration of 1 μg radioactive vitamin B_{12} bound to the N-component, the fraction of the p.o. dose excreted in the urine of this patient in 2 days was 10.8% compared with 1.1% of unbound vitamin B_{12} (1 μg). Neuraminidase digestion of the gastric juice vitamin B_{12}-intrinsic factor complex produced a biologically active product containing the high pI isoproteins typical of mucosa. Thus, the high pI fraction is deficient in sialic acid and apparently consists of material not yet ready to be secreted. Since sialic acid does not appear to be a biologically active part of the intrinsic factor molecule, it is possible that sialic acid must be removed before intrinsic factor can act on ileal receptors. Although sialic acid-deficient intrinsic factor possessed immunological activity, it is possible that sialic acid-deficient intrinsic factor molecules play a role in initiating intrinsic factor autoantibodies in connection with mucosal inflammatory processes.

5214 ON THE CELLULAR DISTRIBUTION OF SUCRASE AND ENTEROKINASE IN DIFFERENT POPULATIONS OF RAT INTESTINAL EPITHELIAL CELLS ISOLATED BY A VIBRATION METHOD. *(E.)* Schneider, R.; Troesch, V.; Hadorn, B. (Unit Gastro-Enterol., Clin. Univ. Pediatr., Berne, Switzerland). *Biol. Gastroenterol. (Paris)* 8(1):11-20, 1975.

The cellular distribution of protein, enterokinase, and sucrase was studied in isolated rat intestinal epithelial cells. Using a modification of Harrison and Webster's vibration technique, four different populations of cells were obtained from fasted male Wistar DA rats. Fractions 1 and 2 were harvested from the villus, fraction 3 was obtained from the villus-crypt junction, and fraction 4 was obtained from the crypts. The cells were incubated with trypsin or suspended in EDTA, sonicated, treated with glycodeoxycholate, and dialyzed. The morphology of the small intestinal mucosa before and after removal of the four cell populations was also studied, as was the appearance of the isolated cells. The specific activity of sucrase was significantly and reproducibly different in these fractions, showing the highest specific activity in the cells from the tip of the villus and a steady decrease in activity toward the crypts. There was only a small scatter of results so that the sucrase activity served as a marker for the different cell populations. Enterokinase showed a similar cellular distribution but the scatter of results was much greater and the activities in the various fractions did not always differ significantly. When expressed as percent of total activity, fraction 4 (immature enterocytes) contained more enterokinase than sucrase. When determined in the presence of glycodeoxycholate, there was a 10-fold increase in enterokinase activity. The effect of glycodeoxycholate was due in part to solubilization of the enzyme and in part to an activation of the system enterokinase-trypsinogen. The sucrase activity was not affected by the addition of glycodeoxycholate or preincubation with trypsin. The results suggest that enterokinase is differentiated earlier in the life cycle of the enterocyte than is sucrase.

5215 STRUCTURE OF RAT BILE CANALICULI AS REVEALED BY SCANNING ELECTRON MICROSCOPY. *(E.)* Motta, P.; Fumagalli, G. (Med. Coll., Univ. Rome, Italy). *Anat. Rec.* 182(4):499-514, 1975.

Topographic details of the surface structure of the rat liver bile canaliculus were studied by scanning electron microscopy. Liver tissue from five healthy, young adult rats was perfused with a Tyrode solution and then with 2.5% glutaraldehyde in cacodylate buffer solution. Small pieces of liver were subsequently excised, immersed in the same fixative, and dehydrated prior to microscopic examination. The bile canaliculi appeared as half tubules carved out of the surface of the hepatocytes. In many cases, the bile channel was observed to bifurcate to form two or three long branches running on the same face of the cell. Some of the canaliculi showed a tortuous course with frequent lateral sacculations and/or very short branches; of the lateral branches, some were large and appeared similar to the short lateral branches of the bile canaliculus, while others were smaller and arose obliquely from the subjacent cortical areas of the hepatocyte cytoplasm. The latter aspect was more easily observed in stereo views which showed narrow intracellular projections bordered with a few microvilli opening into the lumen of the acutal intercellular bile canaliculus. Zones measuring up to 5.0 μ in width between the space of Disse and the bile channel were frequently observed. The narrowest of these (0.1 μ) appeared to represent zones where the intercellular clefts arising from the subendothelial space of Disse and its recesses came into close contact with the wall of the bile canaliculus; direct communication between these spaces was not observed. The lateral sacculations observed in some of the bile canaliculi probably correspond to short intracellular branches of the canaliculi.

5216 ENDOCRINE CELLS IN THE HUMAN STOMACH: OPTICAL AND ULTRASTRUCTURAL STUDY IN NORMAL SUBJECTS AND IN SOME PATHOLOGICAL CONDITIONS. *(Fr.)* LeBodic, M. F.; LeBodic, L.; Lefranc, G.; Mussini-Montpellier, J.; Pradal, G.; Tusques, J. (Fac. Med., Nantes, France). *Ann. Anat. Pathol. (Paris)* 19(4);353-370, 1974.

Samples of gastric mucosa obtained from four normal subjects, four patients with gastric ulcers and nine patients with various digestive disorders were used to study human endocrine cells. Based on histochemical and ultrastructural analysis, six distinct types of endocrine cells were found in the human stomach: 1) serotonin cells, exhibiting characteristic yellow fluorescence and containing dense polymorphic granules; 2) enterochromaffin-like cells, essentially located in the fundus; 3) gastrin cells of antropyloric localization characterized by the uneven density of secreting granules; 4) gastrointestinal D cells morphologically related to D cells of islands of Langerhans; 5) infrequent A cells and; 6) "small granule" cells, found more frequently and corresponding to Sasagawa type III cells. Pathological findings in ulcer patients showed a marked decrease in endocrine cells, especially in gastrin cells of the antral mucosa, and the appearance of a large number of very dark endocrine cells which were not found in normal mucosa. Pathological findings in the other patients were too varied to draw valid conclusions, but a large number of dark endocrine cells were also observed in these cases.

5217 ON THE BLOOD SUPPLY OF THE PANCREAS IN CHILDREN. *(Rus.)* Kushch, N. L.; Timchenko, A. D.; Prikhodchenko, V. V. (Dept. Pediatr. Surg., A. M. Gor'kiy Donetsk Med. Inst., USSR). *Klin. Khir.* (3):24-30, 1975.

5218 FRUCTOSE INDUCED GLYCOGENESIS. I. ULTRASTRUCTURAL AND MORPHOMETRIC ANALYSIS OF RAT HEPATOCYTES 7 DAYS AFTER FRUCTOSE OVERLOAD. *(Ger.)* Riede, U. N.; Uhl, H.; Seufer, G.; Robausch, T.; Bohm, N.; Sasse, D. (Pathol. Inst., Univ. Freiburg, Germany). *Beitr. Pathol.* 154(1):63-82, 1975.

5219 THE MORPHOLOGICAL CHANGES IN THE SMALL INTESTINE IN RATS AFTER ITS BLOOD CIRCULATION HAS BEEN TEMPORARILY INTERRUPTED. *(Rus.)* Kulik, V. P.; Gadshieva, Z. M.; Makarova, L. M.; Maksimenkova, A. N. (Dept. Normal Anat., Lumumba Univ., Moscow, USSR) *Arkh. Anat. Gistol. Embriol.* 68(3): 50-56, 1975.

5220 ENDOCRINE CELLS OF THE INTESTINAL MUCOSA. I. ENTEROCHROMAFFIN CELLS. *(Pol.)* Lamprecht, J. (Cell Pathophysiol. Dept., CMKP, Warsaw, Poland). *Patol. Pol.* 25(4):587-594, 1974.

5221 THE EFFECT OF VAGOTOMY ON THE STRUCTURE AND FUNCTION OF THE SMALL INTESTINE. (REVIEW). *(Rus.)* Postolov, P. M.; Fetisov, V. A. (I. M. Sechenov 1st Moscow Med. Inst., USSR). *Khirurgiia (Mosk.)* (1):144-150, 1975.

5222 ORGAN CULTURE OF GUINEA PIG AND HUMAN INTESTINAL MUCOSA: ULTRASTRUCTURAL, CYTOCHEMICAL AND BIOCHEMICAL STUDY. *(E.)* Kedinger, M.; Haffen, K.; Hauri, H. P.; Schang, J. C.; Hadorn, B.; Grenier, J. F. (INSERM, Strasbourg, France). *Digestion* 11(5/6):450-451, 1974.

5223 LIGHT MICROSCOPIC MORPHOMETRY AND FINE STRUCTURE OF THE LIVER: A RESPONSE TO PERFLUORINATED LIQUID EMULSIONS USED AS ARTIFICIAL BLOOD. *(E.)* Miller, M. L.; Clark, Jr., L. C.; Wesseler, E. P.; Stanley, L.; Emory, C.; Kaplan, S. (Child. Hosp., Cincinnati, Ohio). *Ala. J. Med. Sci.* 12(1):84-113, 1975.

5224 COMPENSATORY HYPERTROPHY OF THE ILEUM FOLLOWING ESOPHAGOILEOSTOMY. *(E.)* Tilson, M. D.; Sweeney, T.; Wright, H. K. (Yale Univ. Sch. Med., New Haven, Conn.). *Surg. Forum* 24:418-419, 1973.

5225 METHODS OF STUDY OF THE G-CELLS' DISTRIBUTION IN THE NORMAL STOMACH. *(E.)* Potet, F.; Constantin-Voillemot, N.; Lewin, M. (Hosp. Beaujon, Clichy, France). *Digestion* 11(5/6):455, 1974.

5226 DRUG-INDUCED HISTOLOGICAL CHANGES AND ITS CONSEQUENCES ON THE PERMEABILITY OF THE SMALL INTESTINAL MUCOSA. II. *(E.)* Nadai, T.; Kume, M.; Tatematsu, A.; Sezaki, H. (Fac. Pharm., Meijo Univ., Nagoya, Japan). *Chem. Pharm. Bull.* 23(3):543-551, 1975.

5227 MORPHOLOGICAL EFFECTS OF A LARGE SINGLE DOSE OF CYCLOHEXIMIDE ON THE INTESTINAL EPITHELIUM OF THE RAT. *(E.)* Altmann, G. G. (Health Sci. Cent., Univ. West. Ontario, London, Canada). *Am. J. Anat.* 143(2):219-240, 1975.

5228 ULTRASTRUCTURE AND DISTRIBUTION OF ARGYROPHIL AND ARGENTAFFIN CELLS IN RECTUM. *(E.)* Ohisaka, K.; Kimura, K.; Makino, K.; Hokano, M. (Tokyo Med. Coll., Japan). *J. Clin. Microsc.* 7(3-4):342-343, 1975.

5229 STUDIES OF ETHIONINE PANCREATITIS BY MEANS OF ELECTRON MICROSCOPIC RADIOAUTOGRAPHY. *(E.)* Yoshizawa, S.; Nagata, A.; Homma, T.; Oda, M.; Murata, F.; Nagata, T. (Shinshu Univ. Sch. Med., Matsumoto, Japan). *J. Clin. Electron Microsc.* 7(3-4):349-350, 1974.

5230 CHOLESTEROL CRYSTALS IN THE GALLBLADDER EPITHELIUM AND THEIR IDENTIFICATION BY DIGITONIN. *(E.)* Koga, A.; Nishimura, M. (First Dep. Surg., Kyushu Univ., Japan). *J. Clin. Electron Microsc.* 7(3-4):252, 1974.

5231 SCANNING ELECTRON MICROSCOPIC STUDIES ON BIOPSY SPECIMEN OF DUODENAL MUCOSA-METHODS OF SAMPLE PREPARATION. *(E.)* Ohashi, Y.; Kita, S.; Kobayashi, R.; Kosaka, K. (Okayama Univ. Med. Sch., Japan). *J. Clin. Electron Microsc.* 7(3-4):339-340, 1974.

5232 ELECTRON MICROSCOPIC STUDIES ON THE EXOCRINE CELLS AND THE ENDOCRINE CELLS OF THE RAT STOMACHS AFTER RESTRAINT. *(E.)* Yamaguchi, T.; Tobe, T.; Hikasa, Y.; Sano, M.; Kanato, M. (Second Dep. Surg., Kyoto Univ., Japan). *J. Clin. Electron Microsc.* 7(3-4):337-338, 1974.

5233 INTESTINAL CRYPT SURVIVAL AFTER X-IRRADIATION OF THE RAT SMALL INTESTINE UNDER CONDITIONS OF RADIOPROTECTION. *(E.)* Osborne, J. W.; Bybee, J. W. (Radiat. Res. Lab., Iowa City, Iowa). *Radiat. Res.* 62(3):523, 570, 1975.

5234 MUCOSAL CELL TRANSIT TIME AND COMPENSATORY RESPONSE IN MURINE INTESTINE. *(E.)* Cooper, J. W.; Burholt, D. R.; Hagemann, R. F., (Allegheny Gen. Hosp., Pittsburgh, Pa.). *Radiat. Res.* 62(3):545, 1975.

5235 A FINE STRUCTURAL STUDY OF ASEXUAL STAGES OF THE MURINE COCCIDIUM Eimeria ferrisi LEVINE AND IVENS 1965. *(E.)* Chobotar, B.; Scholtyseek, E.; Senaud, J.; Ernst, J. V. (Dep. Biol., Andrew's Univ., Berrien Springs, Mich.). *Z. Parasitenk.* 45(4):291-306, 1975.

5236 HISTOCHEMICAL OBSERVATIONS WITH THE LIGHT AND THE ELECTRON MICROSCOPE ON THE MUCOSUBSTANCES OF THE NORMAL MOUSE GALLBLADDER EPITHELIAL CELLS. *(E.)* Wahlin, T.; Bloom, G. D.; Carlsoon, B. (Dep. Pathol. Histol., Univ. Umea, Sweden). *Histochemistry* 42(2):119-131, 1974.

See also, 5245, 5345, 5346, 5378, 5380, 5518, 5567, 5589, 5591, 5592, 5595, 5867, 6031, 6072.

ABSORPTION-EXCRETION-TRANSPORT

5237 THE EFFECT OF VITAMIN A DEFICIENCY ON CELLULAR MEMBRANE PERMEABILITY OF SMALL INTESTINE MUCOSA. *(Ukr.)* Leutskyi, K. M.; Baran, M. M. (Dep. Biochem., Univ. Chernivtsi, USSR). *Ukr. Biokhim. Zh.* 46(1):105-109, 1974.

To elucidate the mechanism of biological functioning of vitamin A, the effect of vitamin A deficiency on the permeability of cellular membranes of small intestine mucosa, and on the intra- and extracellular content of Na, K and water, was studied. Experiments were performed on white rats with initial weight of 50 g, fed on a vitamin A-free diet; the control animals were given daily 250 MU of acetic form of vitamin A. The results showed that A-avitaminosis leads to the increase in membrane permeability of the small intestinal mucosa, to the increase of total and intracellular content of Na ions, to the decrease of total and intracellular content of K ions (thus effecting transmembrane gradient of Na), and to the increase of total and extracellular, but to the decrease of intracellular, content of water.

5238 INTESTINAL ABSORPTION OF CYTIDINE DIPHOSPHATE CHOLINE AND ITS CHANGES IN THE DIGESTIVE TRACT.

(E.) Yashima, K.; Takamatsu, M.; Okuda, K. (Kurume Univ. Sch. Med., Japan). *J. Nutr. Sci. Vitaminol.* 21(1):49-60, 1975.

The intestinal absorption and metabolism of $^{14}CH_3$ and C_5 pyrimidine ^3H-labeled CDP-choline following gastric instillation were studied in fasted, anesthetized Wistar rats. After 3 hr, only 5% of the ^{14}C and 15% of the ^3H dose remained in the gut. Hepatic uptake reached a maximum after 2-3 hr. Little to no radioactivity was found in heart, brain, pancreas or urine. Chromatographic analysis of gastric contents 30 min after ^{14}C-CDP-choline instillation showed radioactivity primarily in the CDP-choline fraction whereas intestinal washings showed label primarily in the choline fraction. Label following ^3H-CDP-choline instillation was found in gastric CDP-choline and intestinal cytodine. One-half of acid soluble ^{14}C was located in hepatocyte CDP-choline, choline phosphate and choline while most of the ^3H was in CMP and cytidine with some in CDP-choline and CDP. These results indicate that CDP-choline is broken down in the intestine to choline and cytidine which are transported and phosphorylated by the intestinal mucosa. The relatively small amounts of $^{14}CO_2$ appearing in expired air (14%) and urine (2%) indicate that only a small amount of choline is completely broken down.

5239 DEPRESSION OF JEJUNAL DIPEPTIDE TRANSPORT BY PYRIDOXINE DEFICIENCY IN THE RAT.

(E.) Gupta, V. J.; Edwards, K. D. G.; Asatoor, A. M. (Sydney Hosp., Australia). *Aust. J. Exp. Biol. Med. Sci.* 53(1):89-92, 1975.

The intestinal absorption of three dipeptides and a dicarboxylic acid dipeptide differing in mechanisms of membrane transport was studied *in vivo* in 20 fasted, anesthetized vitamin B_6-depleted and B_6-sufficient male Sprague-Dawley rats. Absorption from an isolated 5 cm section of distal duodenum and upper jejunum was significantly slowed by 50-60% in B_6-depleted animals compared to B_6-sufficient rats. These results confirm previous ones in which decreased intestinal absorption of L-alanyl-L-phenylalamine glycylglycine and L-leucyl-L-tyrosine was found in B_6-depleted rats. Analysis of variance regression lines for dipeptide and amino acid transport in the present system provided support for the concept that dipeptide transport, like amino acid transport, is non-selectively depressed by B_6 deficiency. The results further suggest that both dipeptide and amino acid transport are mediated by a common step which is B_6-dependent.

5240 DIPEPTIDE TRANSPORT IN ISOLATED INTESTINAL BRUSH BORDER MEMBRANE.

(E.) Sigrist-Nelson, K. (Lab. Biochem., Fed. Inst. Technol., Zurich, Switzerland). *Biochim. Biophys. Acta* 394(2):220-226, 1975.

The transport of glycyl-L-leucine into isolated brush border membrane vesicles was studied in Sprague-Dawley rats. Highly purified brush border membranes from isolated epithelial cells of the rat small intestine were incubated in media containing mannitol, buffer, $MgSO_4$, and (1-^{14}C)glycyl-L-leucine, glycyl-L-(U-^{14}C)leucine, (2-^3H)glycine, and/or L-(4,5-$^3H_2$)-leucine. At equilibrium, the uptake values for glycyl-L-leucine (labeled in the glycine and leucine moiety), glycine, and L-leucine were the same; the uptake of both labeled species of dipeptide being similar, while the time courses for glycine and L-leucine were markedly different. Na^+ stimulated L-leucine transport, had a lesser effect on transport of the dipeptide and did not affect glycine uptake. When the membranes were incubated with the radioactive dipeptide, 80% of the initial radioactive content was dipeptide and 20% was glycine; after 5 min, however, 95% of the radioactivity was in the form of glycine and only 5% was in the form of dipeptide. The uptake of glycyl-L-leucine was inhibited by other dipeptides, particularly leucyl and alanyl peptides, but was unaffected by glycine and L-leucine. Glycyl-L-leucine stimulated the uptake of glycine and L-leucine, the stimulatory effect increasing with time. The data support the concept that glycyl-L-leucine is primarily transported intact across the brush border membrane by a specific mechanism differing from that involved in amino acid transport.

5241 A COMPARATIVE STUDY ON THE EFFECTS OF DIFFERENT BILE SALTS ON MUCOSAL ATPase AND TRANSPORT IN THE RAT JEJUNUM IN VIVO.

(E.) Guiraldes, E.; Lamabadusuriya, S. P.; Oyesiku, J. E. J.; Whitfield, A. E.; Harries, J. T. (Inst. Child Health, London, England). *Biochim. Biophys. Acta* 389(3):495-505, 1975.

Closed-loop and perfusion techniques were used to study the effects of deoxycholate, taurocholate and cholate on mucosal ATPase and transport activity in the rat (Wistar strain) jejunum. In the closed-loop experiments, a 25-min absorptive period was used, while in the perfusion studies the infusate flow rate was 0.2 ml/min. In the closed loops, 5 mM deoxycholate selectively inactivated (Na^+ + K^+)-ATPase, and a net secretion of Na^+ induced by 2.5 mM deoxycholate was due to reduced lumen to plasma flux of the ion. Deoxycholate (2.5 mM) also markedly inhibited 3-O-methylglucose transport. The luminal disappearance rates of deoxycholate (60.5%/g) greatly exceeded those of taurocholate (4.3%/g). In the perfusion studies, 1 mM of deoxycholate induced a net secretion of water, Na^+ and Cl^- and inhibited active glucose transport; "total" ATPase, (Na$^+$ + K$^+$)-ATPase and Mg^{2+}-ATPase were also inhibited. At higher concentrations (5 mM), deoxycholate stimulated Mg^{2+}-ATPase activity. Taurocholate and cholate had no effect on transport or (Na$^+$ + K$^+$)-ATPase, and the activities of mucosal lactase, sucrase, and maltase were not affected by 1 mM deoxycholate, taurocholate, or cholate. The mean disappearance rates of deoxy(^{14}C)cholate, cholate, and taurocholate from the intestinal lumen were 50.0%, 30.0%, and 17.7%/g/min. The results suggest that deoxycholate inhibits sodium-coupled glucose transport *via* inhibition of (Na$^+$ + K$^+$)-ATPase at the lateral and basal membranes of the epithelial cells, rather than from an effect at the brush-border membrane level. (Na$^+$ + K$^+$)-ATPase may play a fundamental role in the physiology of intestinal transport, and inhibitory substances may be important in the pathophysiology of certain types of diarrhea.

5242 A GLUCOSE-STIMULATED NONELECTROGENIC SODIUM PUMP IN ILEAL REMNANTS AFTER JEJUNECTOMY.

(E.) Tilson, M. D.; Clifford, B. (Yale Univ. Sch. Med., New Haven, Conn.). *J. Surg. Res.* 13(4):405-408, 1975.

To determine whether "jejunization" of ileal transport processes may occur after proximal resection, the glucose dependence of sodium transport and the transmural potential differences (PDs) were studied in ileal remnants after jejunectomy in adult Sprague-Dawley rats. Fourteen to 21 days after jejunectomy or sham jejunectomy, an isolated distal ileal segment was perfused with test solutions containing mannitol or glucose. Effluent samples were collected at 30-min intervals and the PD was measured every 5 min. The PD of normal ileum increased from 6.44 with mannitol to 7.70 after perfusion with glucose solution. The PD of ileum from the jejunectomized rats decreased from 4.86 with mannitol to 4.6 with glucose, the mean PD of glucose-stimulated normal ileum being significantly greater. The net sodium flux increased nonsignificantly after glucose stimulation in normal animals, the glucose-stimulated increase being significant in the jejunectomized animals. Net Na absorption was a linear function of water flux in both the normal and jejunectomized animals. These observations are consistent with the hypothesis that the transport process of the adapted ileal remnant may begin to imitate those characteristics of the resected segment, a process which has been termed "jejunization."

5243 THE ACTIVATION OF INTESTINAL BRUSH BORDER SUCRASE BY ALKALI METAL IONS: AN ALLOSTERIC MECHANISM SIMILAR TO THAT FOR THE NA$^+$-ACTIVATION OF NONELECTROLYTE TRANSPORT SYSTEMS IN INTESTINE.

(E.) Mahmood, A.; Alvarado, F. (Sch. Med., Univ. Puerto Rico, San Juan). *Arch. Biochem. Biophys.* 168(2):585-593, 1975.

A model for the activation of intestinal brush border sucrase by alkali-metal ions was applied to new data on the mechanism of the Na$^+$-activation of brush border sucrase from the guinea pig intestine. The model describes the activation by alkali-metal ions by an allosteric, noncompulsory mechanism involving two distinct sites: one for sucrase and another for the metal activator. In the present experiment, sucrase activity was determined with glucose oxidase-peroxidase in guinea pig brush borders incubated in 4 mM Li-succinate containing 20 mM sucrose and Na$^+$, K$^+$, and/or Li$^+$. Both Na$^+$ and K$^+$ activated the guinea pig sucrase, but K$^+$ had 10 times more affinity for the metal activator site; Li$^+$ was inert. Values for the dissociation constants for the interaction of sucrase with sucrose, Na$^+$, or K$^+$ were calculated for these data and for previously recorded data for the rat and hamster. Qualitatively, the activation of sucrase by alkali metal ions was similar to that described for the Na$^+$-activation of amino acid and sugar transport in the intestine. However, the Na$^+$-binding site in the two systems was apparently quite different. In the guinea pig, the Na$^+$-dissociation constant was on the order of 10^{-3} M for sucrase, about two orders of magnitude smaller than that for transport. Also, K$^+$ was a strong activator of guinea pig sucrase, but was an inhibitor of intestinal sugar transport. It is concluded that the brush border sucrase and sugar carrier in the intestinal sugar transport system do not share a common Na$^+$-binding site.

5244 ABSORPTION OF TWO PROLINE CONTAINING PEPTIDES BY RAT SMALL INTESTINE IN VIVO. *(E.)*

Lane, A. E.; Silk, D. B. A.; Clark, M. L. (St. Bartholomew's Hosp., London, England). *J. Physiol.* 248(1):143-149, 1975.

The *in vivo* intestinal absorption of glycyl-L-proline and L-prolyl-glycine, two dipeptides which are poorly hydrolyzed *in vitro* by brush border peptide hydrolases, was investigated in adult male Wistar rats. A steady-state perfusion technique was used and jejunal absorption was compared with ileal absorption using the rates of absorption of constituent amino acids from dipeptide and equivalent equimolar amino acid solutions. Glycine and proline were absorbed at the same or faster rates during perfusion of 10 mM glycyl-L-proline than during the perfusion of its equivalent equimolar amino acid solution. Conversely, the two constituent amino acids were absorbed at slower rates during the perfusion of 10 mM L-prolyl-glycine than during perfusion of its equivalent amino acid solution. As expected, very low concentrations of free amino acids were detected during the jejunal dipeptide perfusions, while higher concentrations were detected during the ileal perfusions. The addition of 40 mM L-prolyl-glycine to the 10 mM glycyl-L-proline solution did not affect the rates of disappearance of glycyl-L-proline. The addition of 40 mM of glycyl-L-proline to 10 mM L-prolyl-glycine, however, had a significant inhibitory effect on the disappearance of L-prolyl-glycine. It is concluded that whereas glycyl-L-proline and L-prolyl-glycine are absorbed predominantly intact in the jejunum, ileal absorption probably involves both direct peptide uptake and absorption of liberated amino acids by specific amino acid transport systems.

5245 MORPHOLOGICAL AND FUNCTIONAL EFFECTS OF BILE SALTS ON RAT COLON. *(E.)* Saunders, D. R.; Hedges, J. R.; Sillery, J.; Esther, L.; Matsumura, K.; Rubin, C. E. (Dep. Med., Univ. Washington, Seattle). *Gastroenterology* 68(5):1236-1245, 1975.

The effects of conjugated and unconjugated bile salts on the morphology of and net water transport across the rat colon were measured *in vivo*. Colonic segments, consisting of the large intestine distal to the cecum, were infused in an isoperistaltic direction in anesthetized male Sprague-Dawley rats. The test infusates consisted of buffered saline, delipidated rat bile (7-9 mM bile salts), 1-3 mM deoxycholate, or 2.5-10 or more mM taurocholate. Epithelial alteration in the colonic absorptive cells was equivocal and water absorption was uninhibited during infusions of delipidated rat bile, 1 mM deoxycholate, or of concentrations of taurocholate less than 10 mM. In contrast, 3 mM deoxycholate and taurocholate in concentrations of 10 mM or greater caused severe alterations in the colonic epithelium as seen under the light microscope, and inhibited water absorption. Under the electron microscope, the absorptive cells covering the colonic mucosal surface of segments infused with higher concentrations of deoxycholate or taurocholate were reduced in height and many showed structural signs of cell injury. Dilation of intercellular spaces was an inconsistent finding which correlated poorly with the rate of net water transport. The results suggest that in some patients with ileal disease, abnormally high bile salt concentrations in the fecal water would be expected to inhibit water absorption and perhaps to alter the structure of colonic absorptive cells.

5246 FATTY ACID INHIBITION OF WATER ABSORPTION AND ENERGY PRODUCTION IN THE HAMSTER JEJUNUM. *(E.)* Gaginella, T.; Bass, P.; Olsen, W.; Shug, A. (Sch. Pharm., Univ. Wisconsin, Madison). *FEBS Lett.* 53(3):347-350, 1975.

To determine the mechanism involved in the fatty acid inhibition of intestinal water and sodium absorption, the effects of hydroxylated and nonhydroxylated octadecenoates on intestinal water transport and adenine nucleotide translocase (ANT) activity were studied in nonfasted male Golden Syrian hamsters. Water transport was assessed using everted gut sacs prepared from 12 cm segments of jejunum distal to the ligament of Treitz. The sacs were incubated with continuously gassed mucosal and serosal buffer solutions containing the fatty acids to be tested. ANT activity was measured directly in the homogenates of mucosal scrapings of sacs incubated without polyethylene glycol. Purified mitochondria were also prepared for respiratory studies. Ricinoleate, ricinelaidate, and oleate inhibited ANT activity and water transport, the latter being a stronger inhibitor of ANT and the two former fatty acids being stronger inhibitors of water transport. Elaidate inhibited neither ANT nor water transport. The ANT-specific inhibitor atractylate inhibited ANT activity by about 90%, but inhibited water transport by only 40%. Oleoyl CoA inhibited respiration in the purified mitochondria, inhibition of the coupled state being reversed by the addition of the uncoupler ClCCP; similar inhibitory effects were observed with atractylate. These results indicate that in the intestine, as in other organs, ANT, by controlling the mitochondrial ATP/(ADP + P_i) ratio can influence the regulation of energy-linked cellular metabolism. This in part accounts for the effects of fatty acids on intestinal water absorption.

5247 THIAMINE TRANSPORT ACROSS THE RAT INTESTINE. I. NORMAL CHARACTERISTICS. *(E.)* Hoyumpa, A. M., Jr.; Middleton, H. M.; Wilson, F. A.; Schenker, S. (Vanderbilt Univ. Med. Sch., Nashville, Tenn.). *Gastroenterology* 68(5):1218-1227, 1975.

The characteristics of normal thiamine transport across the intestine were studied in female Sprague-Dawley rats using intact intestinal loops and everted jejunal segments. *In vivo* studies with (^{35}S)thiamine hydrochloride revealed, in all segments of the small intestine, saturation kinetics for low thiamine concentrations (0.06-1.5 μM), with a linear relationship between higher concentrations (2-560 μM) and absorption. Moreover, *in vitro* studies of net transmural flux using everted jejunal sacs demonstrated movement of (^{14}C)thiamine hydrochloride against a concentration gradient only when low thiamine concentrations were used, so that the serosal to mucosal ratio became significantly greater than the initial value of 1. Pyrithiamine (2 μM), dinitrophenol (200 μM), norethylmaleimide (100 μM), and ouabain (100 μM) reduced the net transmural flux of 0.2 μM thiamine. When unidirectional flux across the jejunum was measured, saturation kinetics were again demonstrated for low thiamine concentrations. This phenomenon, however, was abolished by the addition of pyrithiamine, which exerted competitive inhibition on thiamine absorption. Anoxia and sodium lack reduced the intestinal uptake of 0.5 μM thiamine to 58% and 74%, resp., or normal, but did not affect the uptake of 50 μM thiamine. Lowering the temperature led to a fall in thiamine uptake, the reduction being more marked with low thiamine concentrations (Q_{10}, 1.648) than with high concentrations (Q_{10}, 1.127). Stirring the water layer reduced the K_m to 59% of the unstirred value, while the V_{max} and permeability coefficient remained unchanged. Finally, movement of low concentrations of thiamine against an electrical gradient was observed under conditions of electrical short circuiting and zero potential difference; no such effect was seen with high concentrations. These studies suggest that there exists in the rat a dual system of intestinal thiamine transport: at low concentrations, thiamine is absorbed by an active process; and at high concentrations, transport across the intestine is largely a passive movement.

5248 MUCOSAL UPTAKE IN VITRO OF CHOLESTEROL FROM BILE SALT AND SURFACTANT SOLUTIONS. *(E.)* Feldman, E. B.; Cheng, C. Y. (State Univ. New York Downstate Med. Cent., Brooklyn). *Am. J. Clin. Nutr.* 28(7):692-698, 1975.

Cholesterol influx rates were analyzed across rat jejunum from various mixed micellar solutions of conjugated bile salts. Rat jejunal mucosal sheets were exposed for 1-2 min to 10 mM micellar solutions of taurodeoxycholate, dodecylsulfate, Tween 80, or cetyltrimethylammonium bromide containing cholesterol, 0.25 mM. Monoolein and/or oleic acid were variably added. Cholesterol influx was insignificant in all solubilizers without additives. With taurodeoxycholate, addition of monoolein progressively enhanced influx from 13 nM/cm^2/hr to 29 nM/cm^2/hr (0.67-5.4 mM monoglyceride). Oleic acid, 3 mM, was as effective as 5.4 mM monoolein. Oleic acid, 3 mM, added to monoolein, 3 mM, maximized influx (42 nM/cm^2/hr). With cetyltrimethylammonium bromide, monoolein, 0.67 mM, enhanced influx to 13 nM/cm^2/hr, but further additions of monoolein with or without oleic acid had no added effect. Additives had no significant effect on the influx from the other anionic or nonionic surfactants. The results suggest that factors other than cholesterol, monoolein or oleic acid partition, and micellar size may be determinants of sterol influx, such as specific interactions of bile salt and fatty acid or monoglyceride with the plasma membrane.

5249 EFFECT OF PERFUSION RATE ON ABSORPTION, SURFACE AREA, UNSTIRRED WATER LAYER THICKNESS, PERMEABILITY, AND INTRALUMINAL PRESSURE IN THE RAT ILEUM IN VIVO.

(E.) Lewis, L. D.; Fordtran, J. S. (Univ. Texas Health Science Center, Dallas, Tex.). *Gastroenterology* 68(6):1509-1516, 1975.

The effect of perfusion rate on the absorption of glucose, tritiated water, urea and mannitol was studied in the rat ileum *in vivo*. Groups of eight female Sprague-Dawley rats were perfused with a test solution (each containing 5 g/l of polyethylene glycol as a marker). The first series of experiments utilized a partially obstructed intestinal segment. Glucose absorption from a 72 ml glucose solution and tritiated water absorption increased equally at about 7% as perfusion rate was increased from 10 to 100 ml/min. Glucose absorption from a 4 mM solution was increased by 70% as perfusion rate was increased from 10 to 100 ml/min. Mean intraluminal pressure was 2.9 mm Hg at a perfusion rate of 1 ml/min and increased only slightly when the rate was 10 ml/min. With perfusion rates of 100 and 200 ml/min, pressure rose to 7.5 and 17.8 mm Hg, resp. Because mannitol absorption was 0 at all perfusion rates, none of the enhanced glucose absorption rates was attributed to enhanced mucosal permeability, even though intraluminal pressure was increased at higher perfusion rates. Urea absorption was influenced by surface area and by permeability changes, but not by the thickness of the unstirred water layer. The effect of unstirred water layer thickness on the inhibitory effect of sodium replacement by magnesium on glucose absorption from a 4 mM glucose solution was also studied. Inhibition by sodium removal was equal at 1, 10, 100 and 200 ml/min. Experiments in an unobstructed intestinal segment revealed that the major effect of enhanced perfusion rate was to increase mucosal surface area. These data emphasize the need for a surface area marker in studies done to evaluate the effect of perfusion rate on intestinal absorption *in vivo*, and tritiated water absorption seems preferable to maximal glucose transport rates.

5250 IS PHLORIZIN OR ITS AGLYCON THE INHIBITOR OF INTESTINAL GLUCOSE TRANSPORT? A STUDY IN NORMAL AND LACTASE DEFICIENT MAN.

(E.) Blum, A. L.; Haemmerli, U. P.; Lorenz-Meyer, H. (Med. Clin., Stadtspital Triemli, Zurich, Switzerland). *Eur. J. Clin. Invest.* 5(3):285-288, 1975.

The inhibition of intestinal glucose absorption by phlorizin was studied in ten normal and six lactase-deficient human subjects. Small bowel perfusion studies were performed with a 4-lumen tube, which was introduced into the intestine after an overnight fast; the proximal balloon of the apparatus was placed at the beginning of the third part of the duodenum. For the first 80 min, an isotonic solution containing 167 mM of glucose, 77 mM of NaCl, and 10 g/l of polyethylene glycol was perfused at a rate of 10 ml/min; in some subjects, 2 mM of phlorizin were added to this solution during the following 80-min period. Intestinal aspirates were collected throughout the experiment and glucose content was measured using the hexokinase method. During the control period, glucose absorption was 8.57 g/hr in the controls and 9.99 g/hr in the subjects with lactase deficiency. Steady state was not reached in the perfused segments during this period. Following phlorizin administration, there was a rapid reduction in glucose absorption, which reached, at the end of this period, 31.5% of the mean absorption rate before phlorizin in the controls and 33.0% in the lactase-deficient subjects. In normal subjects receiving no phlorizin, the absorption rate remained constant during the second period. The results suggest that phlorizin directly inhibits glucose transport in man and that phlorizin hydrolase is not necessary for this effect.

5251 SUGAR ABSORPTION BY FOETAL AND NEONATAL RAT INTESTINE IN VITRO.

(E.) Bamford, D. R.; Ingham, P. A. (Dep. Zool., Queen's Univ., Belfast, Ireland). *J. Physiol. (Lond.)* 248(2):335-348, 1975.

The development of jejunal sugar absorption by fetal and neonatal rat intestine was studied using an *in vitro* accumulation technique. Jejunal segments from fetal and neonatal rats (aged 5 to 26 days) were incubated for 30 min in 5.0 mM of D-galactose. The highest level of uptake was just before birth and throughout the first week post partum. The integrity of the absorbed sugar was checked by chromatography; no appreciable metabolism of galactose took place during the incubations. When rings of fetal or neonatal intestine were incubated in 2,4-dinitrophenol, significant reductions (101.92 to 66.7 μM/g) in galactose uptake were observed. Before "cut-off" (the time at which the absorption of intact protein ceased), the ileum was significantly more effective in galactose absorption than the jejunum or duodenum. Around "cut-off" the jejunum became the principal site of absorption. The adult pattern of functional localization along the intestine was not fully established until after the third week post partum. The results suggest that variations with respect to age in the distribution or density of the sugar carriers along the intestine, rather than changes in the nature of the carriers themselves, account for the variation in sugar absorption.

5252 THE EFFECT OF RAISING THE CONCENTRATION OF POTASSIUM IN THE BLOOD OR INTESTINAL LUMEN ON THE TRANSPORT OF POTASSIUM IN THE DOG INTESTINE. *(E.)* Hardy-Smith, A.; Shields, R. (Dep. Surg., Univ. Liverpool, England). *Br. J. Surg.* 62(6):455-461, 1975.

The rates of transport of potassium, sodium, and water across the intestinal mucosa of Thiry-Vella fistulas of colon and ileum were studied in four dogs over a period of several months under three conditions: control, following i.v. infusion of potassium (15 mEq) over 30 min, and during variations in the intraluminal concentration of potassium (0.8-16.0 mEq/l). Following i.v. infusion of potassium, the rates of potassium secretion into the colon were usually increased; the rates of sodium and water absorption were either unchanged or decreased. The unidirectional rate of movement of potassium into the lumen increased as the concentration difference across the mucosa increased; the movement of potassium in the opposite direction remained relatively constant. The unidirectional movement of sodium and water into the lumen of the colon also increased but to a lesser extent. The effect on potassium transport in the ileum was not significant. With increase in the intraluminal concentration of potassium, there was a significant decrease in the rate of net potassium secretion in both colon and ileum. The rates of net absorption of sodium and water were not significantly altered. Unidirectional potassium movement into the body increased in all the ileal fistulas. The results suggest that whenever the concentration of potassium in the plasma rises, potassium secretion into the gastrointestinal lumen is increased.

5253 INTESTINAL AMINO ACID ABSORPTION IN VITAMIN D DEPENDENT RICKETS. *(Ger.)* Harmeyer, J.; Martens, H.; Vogelgesang, G. (Physiologisches Inst. der Tierarztlichen Hochschule, D-3000 Hannover, Bischefshofer Damm 15, Germany). *Z. Kinderhoilkd.* 119(4):245-251, 1975.

5254 DISULFIRAM AND GASTROINTESTINAL MOTILITY: EFFECT OF ETHANOL ABSORPTION IN THE RAT. *(Fr.)* Lamboeuf, Y.; De Saint Blanquat, G.; Derache, R. (Inst. Physiol., Toulouse, France). *Arch. Int. Pharmacodyn. Ther.* 213(1):163-169, 1975.

5255 EFFECT OF A DEGLYCYRRHIZINISED LIQUORICE COMPOUND ON THE GASTRIC MUCOSAL BARRIER OF THE DOG. *(E.)* Morris, T. J.; Calcraft, B. J.; Rhodes, J.; Hole, D.; Morton, M. S. (Univ. Hosp. Wales, Cardiff). *Digestion* 11(5/6):355-363, 1974.

5256 EFFECTS OF CHOLERA TOXIN ON TRANSCELLULAR Na TRANSPORT OF RABBIT ILEUM. *(E.)* Desjeux, J. F.; Curran, P. F. (Hosp. Herold, INSERM U-83, Paris, France). *Digestion* 11(5/6):443, 1974.

5257 EFFECT OF GLUCOSE ABSORPTION ON POTASSIUM MOVEMENTS IN THE HUMAN JEJUNUM. *(E.)* Bernier, J. J.; Modigliani, R.; Matuchansky, C.; Rambaud, J. C. (INSERM U-54, Hosp. St. Lazare, Paris, France). *Digestion* 11(5/6):439, 1974.

5258 EFFECTS OF CARBENOXOLONE SODIUM AND OF ASPIRIN ON GASTRIC MUCOSAL POTENTIAL DIFFERENCE IN NORMAL SUBJECTS. *(E.)* Bennett, P. N.; Frigo, G. M.; Weerasinghe, W. M. T.; Lennard-Jones, J. E. (Univ. Coll. Hosp., London, England). *Scand. J. Gastroenterol.* 10:161-164, 1975.

5259 DUODENAL HORMONES AND INTESTINAL POTENTIAL DIFFERENCE. *(E.)* Wingate, D. L.; Cooper, W. (London Hosp. Med. Coll., England). *Digestion* 11(5/6):462, 1974.

5260 EFFECT OF AN ULCER ON THE GASTRIC MUCOSAL BARRIER IN DOGS. *(E.)* Cooke, A. R.; Kienzle, M. G.; Tubbesing, T. J. (Veterans Hosp., Iowa City, Iowa). *Digestion* 11(5/6):347-354, 1974.

5261 EFFECT OF FREE AND BOUND GOSSYPOL ON THE ABSORPTION OF L-(^{14}C)LYSINE, L-(^{14}C)-METHIONINE, AND L-(^{14}C)VALINE FROM THE RAT SMALL INTESTINE. *(E.)* Jones, L. A.; Smith, F. H. (Dep. Animal Sci., North Carolina State Univ., Raleigh). *J. Agr. Food Chem.* 23(4):647-653, 1975.

5262 MECHANISM OF THE INTESTINAL ABSORPTION OF DRUGS FROM OIL IN WATER EMULSIONS. V. ENHANCED ABSORPTION OF METHYL ORANGE ADSORBED AT OIL/WATER INTERFACE IN EMULSIONS. *(E.)* Ogata, H.; Kakemi, K.; Furuya, A.; Fujii, M.; Muranishi, S.; Sezaki, H. (Fac. Pharm. Sci., Kyoto Univ., Japan). *Chem. Pharm. Bull.* 23(4):716-724, 1975.

5263 CALCIUM UPTAKE BY ISOLATED SMALL INTESTINAL BRUSH BORDER MEMBRANES FOLLOWING DIETARY CALCIUM RESTRICTION. *(E.)* Krawitt, E. L.; Katagiri, C. A. (Dep. Med., Univ. Vermont, Burlington, Vt.). *Gastroenterology* 68(4):930, 1975.

5264 CHANGES IN INTESTINAL TRANSPORT FOLLOWING JEJUNOILEAL BYPASS SURGERY. *(E.)* Kozloff, I.; Jackson, M. J.; Joseph, W. L. (George Washington Univ. Med. Cent., Washington, D.C.). *Gastroenterology* 68(4):929, 1975.

5265 THE EFFECTS OF ACUTE ALTERATIONS IN HEMODYNAMICS, OXYGEN AVAILABILITY AND ACID BASE BALANCE ON THE PERMEABILITY OF THE GASTRIC MUCOSA. *(E.)* Ritchie, Jr., W. P. (Dep. Surg., Univ. Virginia, Charlottesville). *U.S. Dept. Comm. Nat. Tech. Infor. Serv.* 75(12):40, 1975.

5266 PROTEIN ABSORPTION BY NEONATAL PUPS THROUGH TWO WEEKS OF NEONATAL LIFE. *(E.)* Staley, T. E. (Coll. Vet. Med., Oklahoma State Univ., Stillwater). *Am. J. Dig. Dis.* 20(6):596-597, 1975.

See also, 5269, 5568, 5580.

MOTILITY

5267 SELECTIVE ANTAGONISM OF THE INTESTINAL STIMULATORY EFFECTS OF MORPHINE BY ISOPROTERENOL, PROSTAGLANDIN E_1 AND THEOPHYLLINE. *(E.)* Grubb, M. N.; Burks, T. F. (Univ. Texas Med. Sch., Houston). *J. Pharmacol. Exp. Ther.* 193(3):884-891, 1975.

Studies were undertaken to determine whether treatment with isoproterenol, prostaglandin E_1 and theophylline would inhibit intestinal responses to morphine without interfering with motor responses to acetylcholine. Contractions (induced by graded, intraarterial bolus doses of morphine and acetylcholine) were measured in isolated segments of adult mongrel dog intestine perfused *via* the vasculature with Kreb's solution. Addition of the α- and β-adrenergic receptor agonist, norepinephrine (0.2 μg/ml), to the perfusion solution slightly decreased the magnitude of contractor responses to acetylcholine; responses to morphine were decreased considerably. The pure α-adrenergic receptor agonist, methoxamine (50 μg/ml), and the pure β-adrenergic receptor agonist, isoproterenol (5 μg/ml), produced similar effects. Perfusion of intestinal segments with Kreb's solution containing prostaglandin E_1 (1 μg/ml) or theophylline (180 μg/ml) resulted in marked decreases in responses to morphine but had no significant effects on responses to acetylcholine. Patterns of inhibition similar to those seen with morphine have been previously observed with 5-hydroxytryptamine, which may mediate the intestinal stimulatory effects of morphine. The mild inhibitory effects of methoxamine and isoproterenol on responses to acetylcholine are attributed to actions on neural and possibly non-neural adrenergic receptors. Since isoproterenol, prostaglandin E_1 and theophylline have in common the ability to elevate or maintain intracellular levels of cyclic AMP (cAMP), it is suggested that the intestinal stimulatory effects of morphine may result from 5-hydroxytryptamine-mediated interference with smooth muscle inhibitory actions of cAMP.

5268 INTERACTION BETWEEN ALUMINUM AND CALCIUM IONS IN POTASSIUM CHLORIDE DEPOLARIZED GASTROINTESTINAL SMOOTH MUSCLE. *(E.)* Hava, M.; Hurwitz, A. (Univ. Kansas Med. Cent., Kansas City). *Arch. Int. Pharmacodyn. Ther.* 214(2):213-223, 1975.

The effects of aluminum chloride and lanthanum chloride on gastrointestinal smooth muscle (under varying conditions of depolarization) were described, in order to define the interaction of these trivalent cations with calcium. Isolated colon (2-3 cm portions) from male Sprague-Dawley rats, and segments from guinea pig ileum were used. Aluminum chloride (5×10^{-4} M) abolished the inhibitory effects of papaverine chloride (1.5×10^{-5} M) on contractions of ileum and colon evoked by calcium in Tyrode's solution containing a high concentration of KCl. The inhibitory effects of cocaine hydrochloride (10^{-3} M) and $MgSO_4$ (2×10^{-2} M) were not antagonized. In isolated colon (depolarized by partial exchange of NaCl by 40 mM KCl), $AlCl_3$ decreased the phasic contractions and slowed the onset of tonic contraction during increase of the $CaCl_2$ concentration from 1.8×10^{-3} M to 7.2×10^{-3} M. The increase in spontaneous activity was not blocked by atropine sulfate (10^{-7}-10^{-4} M), but was partially antagonized by 10^{-3} M caffeine and was completely blocked by papaverine chloride (5×10^{-4} M). More than one site of action is proposed for the effects of aluminum on gastrointestinal smooth muscle.

5269 INHIBITION OF SMALL INTESTINAL MUCOSAL AND SMOOTH MUSCLE CELL FUNCTION BY RICINOLEIC ACID AND OTHER SURFACTANTS. *(E.)* Gaginella, T. S.; Stewart, J. J.; Gullikson, G. W.; Olsen, W. A.; Bass, P. (Cent. Health Sci., Univ. Wisconsin, Madison). *Life Sci.* 16(10):1595-1606, 1975.

The effects of ricinoleic acid on the inhibition of net water and on electrolyte transport and intestinal smooth muscle contractile response *in vitro* were compared with the effects produced by two structurally different, anionic surfactants, a non-ionic surfactant and two bile salts. Net water and electrolyte transport from everted hamster (Golden Syrian) gut sacs and contractile activity of electrically-stimulated guinea pig ileum were assessed. Sodium ricinoleate, dioctyl sodium sulfosuccinate, sodium dodecyl (lauryl) sulfate, polysorbate 80, sodium deoxycholate and chenodeoxycholate were found to produce depression of *in vitro* mucosal and smooth muscle cell function. All compounds were effective depressants of both systems at concentrations which were likely to be below their respective critical micellar concentrations. It is suggested that ricinoleic acid may produce its cathartic effect due to its amphipathic nature, possibly by hydrophobic interaction with membrane lipoproteins. Ricinoleic acid and the other surfactants may be acting through a common mechanism.

5270 EFFECTS OF BOMBESIN AND BOMBESIN-LIKE PEPTIDES ON GASTROINTESTINAL MYOELECTRIC ACTIVITY. *(E.)* Caprill, R.; Melchiorri, P.; Improta, G.; Vernia, P.; Frieri, G. (Second Med. Clin., Rome, Italy). *Gastroenterology* 68(5):1228-1235, 1975.

The effects of bombesin and bombesin-like peptides on the electrical activity in the gastrointestinal tract were studied in conscious mongrel dogs. Electrodes were chronically implanted in the intestinal muscle layer at different levels between the stomach and rectum. Bombesin (5, 10, 15, 30 ng/kg/min), COOH-terminal heptapeptide and COOH-terminal octapeptide (20 and 80 ng/kg/min), COOH-terminal nonapeptide (10, 15, 30 ng/kg/min), and litorin (a new natural peptide isolated from the skin of *Litoria aurea*, 10, 20, 30, 40 ng/kg/min were infused for 20 min into the saphenous vein. The effects of the drugs on frequency, amplitude, and rhythm of pacesetter potentials (PP) and incidence of spikes were evaluated. Bombesin significantly increased the frequency of PP in the antrum, duodenum, jejunum, and ileum. In the duodenum and jejunum, the increase in PP frequency showed a linear correlation with the reduction in PP amplitude, the propagation velocity of PP also being clearly reduced. Spikes were not affected in the antrum and ileum, whereas they were abolished in the duodenum and jejunum. In the duodenum, the increase in PP frequency and the slowing down of the propagation velocity were followed by a loss of PP phase lock and the appearance of a characteristic electrical pattern consisting of an irregular sequence of small and slow potentials ("electric disorganization"). The mechanical counterpart was the disappearance of intraluminal pressure activity. In the colon, the effect of bombesin on electrical activity was inconsistent. Neither the COOH-terminal heptapeptide nor the octapeptide of bombesin showed a significant effect on myoelectric activity, whereas the effects of COOH-terminal-nonapeptide and litorin were similar to those of bombesin. Thus, the characteristic electrical changes of PP produced by bombesin appear to be related to the sequence of the 9 amino acids in the COOH-terminal residue of the bombesin molecule.

5271 INHIBITION OF GASTRIC EMPTYING IS A PHYSIOLOGICAL ACTION OF CHOLECYSTOKININ. *(E.)* Debas, H. T.; Farooq, O.; Grossman, M. L. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterology* 68(5):1211-1217, 1975.

The relative effects of cholecystokinin (CCK) and gastrin on gastric emptying in the dog were compared to determine whether CCK plays a physiological role in the inhibition of gastric emptying. Dogs were prepared with gastric fistulas, gastric fistulas and chronic pancreatic fistulas, or gastric fistulas and chronic bile fistulas. To stimulate physiological conditions, CCK, OP-CCK (synthetic C-terminal octapeptide CCK), and 20% CCK were administered by continuous i.v. infusion in doses known to be submaximal for pancreatic protein secretion and gallbladder contraction (0.75-3.0 U/kg/hr for CCK, 1.5-6.0 U/kg/hr for 20% CCK, and 63-250 ng/kg/hr for OP-CCK); in addition, L-tryptophan (10-40 mM/liter) was administered to determine the action of endogenous CCK. The effect of endogenously released CCK was studied by measuring the rate of emptying of NaCl solutions in which different concentrations of tryptophan replaced equiosmolar amounts of NaCl, the rate of emptying of the NaCl solution also being measured after exogenous administration of the test drugs. The D_{50}'s of 20% CCK (3 U/kg/hr) and of OP-CCK (125 ng/kg/hr) for inhibition of gastric emptying were about the same as their D_{50}'s for cholecystokinetic and pancreozyminic actions. In contrast, although both pentagastrin and heptadecapeptide gastrin inhibited gastric emptying, the doses required for this action were much higher than the D_{50}'s required for stimulation of gastric acid secretion. Both pure CCK and tryptophan were potent inhibitors of gastric emptying, and both protein secretion and gallbladder contraction were stimulated during tryptophan-inhibited gastric emptying. The results indicate that the inhibition of gastric emptying is attributable to CCK itself and not to an impurity in the CCK preparation. They further indicate that the inhibition of gastric emptying is one of the physiological actions of CCK, while the effect of gastrin is due to a pharmacological action.

5272 THE EFFECTS OF CHRONIC GANGLION BLOCKADE AND CHRONIC CHOLINESTERASE INHIBITION ON THE SENSITIVITY OF RABBIT STOMACH MUSCULARIS TO CHOLINERGIC AND ADRENERGIC AGONISTS. *(E.)* Lefever, G. S.; Green, R. D. (Univ. Illinois Med. Cent., Chicago). *J. Pharmacol. Exp. Ther.* 193(3):739-747, 1975.

The effects of chronic ganglion blockade and chronic cholinesterase inhibition on the sensitivity of the circular muscle from the rabbit stomach fundus to cholinergic and alpha adrenergic agonists were studied. The EC50 values, dissociation constants (K_A values), and efficacies of various agonists were determined in strips of stomach muscularis from control, chlorisondamine-pretreated and disulfoton-pretreated male and female rabbits. Strips from chlorisondamin-pretreated animals were supersensitive to carbachol but normosensitive to phenylephrine; the efficacy but not the K_A of carbachol was affected by this treatment. The dissociation constant (K_B) of atropine was unchanged. Muscle strips from animals treated with disulfoton were subsensitive to phenylephrine but normosensitive to amidephrine and carbachol, both the efficacy and K_A of phenylephrine appearing to be elevated by this treatment. The K_B of phentolamine remained unchanged. The results indicate that the chlorisondamine-induced supersensitivity is the result of a change beyond the level of the cholinergic receptors. The subsensitivity to phenylephrine after disulfoton pretreatment may result, at least in part, from a qualitative change in the alpha adrenergic receptors in the stomach muscularis.

5273 RADIOIMMUNOASSAY FOR MOTILIN. *(E.)* Dryburgh, J. R.; Brown, J. C. (Dep. Physiol., Univ. Br. Columbia, Vancouver, Canada). *Gastroenterology* 68(5):1169-1176, 1975.

A specific radioimmunoassay for the measurement of motilin in the sera of dogs was developed with the use of antisera to porcine motilin raised in guinea pigs. Antisera to the porcine motilin was raised in guinea pigs by multiple injections of both conjugated and unconjugated polypeptide. Alkalinization studies were then performed using sera from fasted chronic dogs with extrinsically denervated pouches of the fundus of the stomach and Mann-Bollman fistulae into the duodenum. The radioimmunoassay procedure employed highly purified ^{125}I-motilin as the tracer; a sensitivity range of 10-320 pg was found. No cross-reactivity was demonstrated with gastric inhibitory polypeptide, secretin, glucagon, gastrin, cholecystokinin-pancreozymin, or vasoactive intestinal peptide. In the dogs with denervated pouches of the fundus of the stomach and Mann-Bollman fistulae, duodenal alkalinization resulted in an increase in the gastric motor activity in the fundic pouch with a corresponding increase in serum motilin, both parameters reaching their maxima within 5 min. These results strongly support the hypothesis that motilin is the peptide released upon alkalinization of the duodenum.

5274 PROPERTIES OF MECHANOSENSITIVE NEURONS WITHIN AUERBACH'S PLEXUS OF THE SMALL INTESTINE OF THE CAT. *(E.)* Mayer, C. J.; Wood, J. D. (Univ. Kansas Med. Cent., Kansas City). *Pfluegers Arch.* 357(1-2):35-49, 1975.

Extracellular techniques of single unit recording were used to study the response patterns of mechanosensitive neurons located within the ganglia of the myenteric plexus of the duodenum and jejunum of the cat. Segments of duodenum and jejunum from adult cats were mounted within chambers and the myenteric plexus was exposed. Action potentials of the mechanosensitive neurons within the ganglia were detected extracellularly, changes in the discharge pattern of the cell being elicited by mechanical distortion of the ganglion. Most recordings were from the periphery of the serosal side of the ganglia. Three different kinds of mechanosensitive neurons were detected within Auerbach's plexus. Neurons classified as fast-adapting mechanoreceptors discharged spikes at the onset of stimulation, and the discharge stopped during a sustained stimulus of constant intensity. Slowly-adapting mechanoreceptors maintained a steady discharge during sustained stimulation at a frequency which was a direct function of the intensity of the stimulus. Tonic-type neurons responded to mechanical stimulation with a prolonged train of spikes which had a consistent pattern from preparation to preparation. Once the tonic-type cells were triggered, the discharge followed a characteristic time course that was unchanged by further increase or decrease in stimulus activity. Tonic-type neurons are probably not first order sensory neurons, but they may be activated by input derived from primary mechanoreceptors. The frequency of discharge of the slowly-adapting mechanoreceptors was increased by histamine; this appeared to be secondary to histamine-induced contractile activity of the musculature.

5275 CONTROL OF GASTRIC EMPTYING BY OSMOLALITY OF DUODENAL CONTENTS IN MAN. *(E.)* Meeroff, J. C.; Go, V. L. W.; Phillips, S. F. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 68(5): 1144-1151, 1975.

Osmoreceptors within the human duodenum were studied and some aspects of their mechanism of action were elucidated. A 500 ml liquid test meal of varying osmolality was introduced *via* gastric tube into 20 fasted male volunteers. Solutions of varying osmolality were also perfused into the duodenum *via* duodenal perfusion tube. Recovery of the nonabsorbable marker, phenol red, from the duodenum was used to measure and time the rate of gastric emptying. The rates of release of cholecystokinin-pancreozymin (CCK-PZ), gastrin, trypsin, and bile fluids were also measured. Gastric emptying was fastest when the duodenal contents were isotonic; nonisotonic duodenal contents (hypotonic and hypertonic) slowed emptying whether these conditions were achieved by nonisotonic duodenal perfusates or by emptying of a nonisotonic test meal. However, nonisotonic solutions in the stomach and jejunum did not slow gastric emptying so long as the duodenal contents were isotonic. Perfusion of the duodenum with 840 milliosmolar sodium chloride produced an insignificant increase in bile acid and trypsin outputs into the duodenum. When a test meal was given while hypertonic duodenal perfusion was continued, bile acid output peaked while the output of trypsin showed a concomitant sharp increase. When the test meal was emptied and its residual was aspirated from the stomach, the duodenal bile acid and trypsin values returned to basal levels. There were no changes in the fasting serum levels of gastrin or CCK-PZ. The results indicate that osmoreceptors, which slow gastric emptying, are present in the duodenum but not in the jejunum or stomach.

5276 EFFECT OF HYPOTHALAMIC, AMYGDALOID AND CINGULATE GYRUS STIMULATION ON COLONIC MOTILITY. *(Ukr.)* Motuznyi, V. A. (Inst. Physiol., State Univ., Kiev, USSR). *Fizol Zh* 19(6):753-759, 1973.

Colonic motility during different functional stages of the gastrointestinal tract was investigated together with the effect of electric stimulation of the hypothalamus, amygdala, and cingulate gyrus on this type of activity. Experiments were performed on dogs with colon fistulas, and four-polar electrodes implanted into the hypothalamus, amygdala, and cingulate gyrus. Data indicate that colonic motility is characterized by phases associated with mixing, intensive absorption of contents, formation of feces and their motion toward the rectum. The effects of electrical stimulation depended on the functional state of the colon and localization of stimulation. Stimulation of the ventromedial hypothalamic nuclei and macro- and microcellular basal amygdaloid nuclei increased colonic motility; stimulation of the posterior hypothalamus inhibited it. Electrical stimulation of the lateral hypothalamic nuclei affected colonic motility (causing contractions) only with current intensity of at least 1.2 millampere. The anterior cingular stimulation produced the proximal colonical motility followed by inhibition or relaxation in the distal colon.

5277 REASEC'S ACTION ON THE MOTORICITY OF THE ESOPHAGUS AND CARDIAC SPHINCTER IN CATS. *(Rus.)* Krasilnikov, K. B. (Inst. Physiol., Kiev. Univ., USSR). *Farmakol. Toksikol.* 38(2):200-202, 1975.

MOTILITY

5278 STUDIES ON THE ROLE OF GASTRO-INTESTINAL INTEROCEPTORS IN THE PROCESS OF CONDITIONING OF ALIMENTARY INSTRUMENTAL REFLEXES. *(Pol.)* Cytawa, J.; Luszawska, D.; Schoenborn, R.; Zajec, M. (Inst. Med. Biol., Med. Acad., Gdansk, Poland). *Przegl. Lek.* 31(2):277-282, 1974.

5279 HORMONAL CONTROL OF GASTROINTESTINAL MOTILITY. *(E.)* Harvey, R. F. (Bristol R. Infirm., England). *Am. J. Dig. Dis.* 20(6):523-539, 1975.

5280 EFFECTS OF HEXAMETHONIUM AND OTHER GANGLIONIC BLOCKING AGENTS ON ELECTRICAL ACTIVITY OF THE ESOPHAGUS INDUCED BY VAGAL STIMULATION IN THE DOG. *(E.)* Toyama, T.; Yokoyama, I.; Nishi, K. (Kumamoto Univ. Med. Sch., Japan). *Eur. J. Pharmacol.* 31(1):63-71, 1975.

5281 ROLE OF PROSTAGLANDINS IN TONE AND EFFECTOR REACTIVITY OF THE ISOLATED RAT STOMACH PREPARATION. *(E.)* Frankhuijzen, A. L.; Bonta, I. L. (Dep. Pharmacol., Erasmus Univ., Rotterdam, Netherlands). *Eur. J. Pharmacol.* 31(1):44-52, 1975.

5282 CONTROL OF GASTRIC EMPTYING AND MOTILITY. *(E.)* Cooke, A. R. (VA Hosp., Iowa City, Iowa). *Gastroenterology* 68(4):804-816, 1975.

5283 MODIFICATION OF THE TONUS AND DRUG-INDUCED CONTRACTION OF THE ISOLATED RAT ILEUM BY REMOVAL OF Na FROM BATHING MEDIA. *(E.)* Taniyama, K. (Kobe Univ. Sch. Med., Japan). *Jpn. J. Pharmacol.* 24(3):433-438, 1974.

5284 ANALYSIS OF ERGOTAMINE--5-HT INTERACTION ON THE ISOLATED RAT STOMACH PREPARATION. *(E.)* Frankhuijzen, A. L. (Dep. Pharmacol., Erasmus Univ., Rotterdam, Netherlands). *Eur. J. Pharmacol.* 30(2):205-212, 1975.

See also, 5249, 5289, 5314, 5566.

SECRETION AND METABOLISM

5285 ACTION OF GASTRIN ON GASTROINTESTINAL STRUCTURE AND FUNCTION. *(E.)* Johnson, L. R.; Lichtenberger, L. M.; Copeland, E. M.; Dudrick, S. J.; Castro, G. A. (Univ. Texas Med. Sch., Houston). *Gastroenterology* 68(5, Part 1):1184-1192, 1975.

The effects of continuous pentagastrin (6 μg/kg-hr) and histamine (1 mg/kg-hr) infusion on gastrointestinal structure were studied in 12 male Sprague-Dawley rats maintained by i.v. hyperalimentation for 19 days. Compared to six sham-operated controls, i.v.-fed rats had a 3-fold lower antral and an 8-fold lower serum gastrin level; these levels were not affected significantly by continuous pentagastrin infusion. Oxyntic stomach, small intestine and pancreatic weights were reduced by 25%, 50% and 45%, resp., in hyperalimented rats. Weights of nongastrointestinal tract organs (kidneys, spleen and testes) were not affected by hyperalimentation. Pentagastrin infusion significantly increased oxyntic stomach, small intestine and pancreatic weights to levels near to or exceeding those of control, orally-fed animals. Pentagastrin infusion also completely prevented loss of brush border disaccharidase activity in hyperalimented rats. Infusion of histamine at a dose rate producing gastric acid secretion comparable to that produced by pentagastrin infusion failed to increase organ weights or disaccharidase activity in hyperalimented rats. It is thus concluded that pentagastrin prevents the changes in gastrointestinal structure and function caused by the absence of food in the gut and that the trophic action of gastrin is necessary for the maintenance of this functional and structural integrity.

5286 THE RELATIONSHIP OF INTESTINAL FAT TO AN AUGMENTED ACID AND GASTRIN RESPONSE IN DOGS WITH A REVERSIBLE PANCREATIC FISTULA. *(E.)* Hofmann, J. W.; Raih, T. J.; Go, V. L. W.; Wilson, S. D. (Med. Coll. Wisconsin, Milwaukee). *J. Surg. Res.* 18(4):409-415, 1975.

The relationship between duodenal fat and gastrin and acid responses to meals was investigated in mongrel dogs with reversible pancreatic fistulas and Heidenhain pouches. The acid response from the Heidenhain pouches and the serum gastrin response to a standardized meal were determined with the pancreatic fistula closed (pancreatic juice flowing normally into the duodenum) and open (pancreatic juices diverted externally). In a second group of dogs, the response to a test meal was determined during infusion of olive oil (0.38 cc/min) or oleic acid (0.23 cc/min) into the duodenum. The acid response to feeding with the fistula open was significantly greater than with the fistula closed, as was the mean 3-hr integrated gastrin response; the fasting serum gastrin concentrations with the fistula closed did not differ significantly from those with the fistula open. Infusion of either olive oil or oleic acid into the duodenum resulted in a significant inhibition of the meal-stimulated acid output when the pancreatic juices were allowed to drain normally into the duodenum; the acid response recovered more rapidly after olive oil perfusion than after oleic acid. With the fistula opened, only oleic acid infusion significantly inhibited the augmented acid response to a meal; the integrated gastrin response to a meal was not augmented. There were no pathologic changes noted in the pancreas or liver of any of the dogs. The results suggest that the augmented acid and gastrin response to feeding that occurred when the pancreatic juice was diverted externally resulted from an impaired digestion of fats. They support the hypothesis that during a meal, the by-products of fat digestion normally stimulate the release of a hormone from the duodenum and small bowel and that this hormone acts, in part, to inhibit the meal-stimulated release of gastrin from the antrum.

5287 SIMULTANEOUS CHANGES IN PANCREATIC AND GASTRIC SECRETION INDUCED BY ACUTE INTRAVENOUS ETHANOL INFUSION: EFFECTS OF ATROPINE AND RESERPINE. *(E.)* Tiscornia, O. M.; Palasciano, G.; Dzieniszewski, J.; Sarles, H. (Unit Pathol. Dig. Dis., Marseille, France). *Am. J. Gastroenterol.* 63(5):389-395, 1975.

The effect of i.v. ethanol on gastric and pancreatic secretion was studied in dogs, along with the effect of simultaneous atropine or reserpine perfusion. Four dogs were prepared with chronic pancreatic fistulas and Thomas cannulas were inserted into the most dependent segment of the stomach. Four weeks later, the fasted dogs were subjected to continuous i.v. GIH secretin (0.5 CU/kg/hr) and gastrin (6 γ/kg/hr) infusion; i.v. ethanol infusion (1.3 g/kg) was begun when both the gastric and pancreatic secretion rates had reached plateau levels. In some experiments, atropine infusion (1.0 mg/hr) was begun after hormone infusion and before ethanol infusion, and in others, the dogs were treated with reserpine (0.10 mg/kg/24 hr) for 48 hr beginning 72 hr before hormone infusion. Acute i.v. ethanol inhibited the pancreatic secretion of protein (concentration and output) and stimulated gastric acid secretion. Atropine abolished the ethanol-mediated inhibition of pancreatic protein secretion but did not prevent the alcohol-mediated gastric acid stimulation. Reserpine did not modify the ethanol-mediated inhibition of pancreatic secretion, but it did induce a high plateau level of HCl secretion which obscured the presumed ethanol-mediated excitatory influences on the oxyntic cells. The results suggest that the ethanol-mediated inhibitory effects on pancreatic secretion are probably related to the stimulation of inhibitory fibers in the vagi. They also suggest that adrenoceptive receptors are involved in the excitatory effects of ethanol on HCl secretion.

5288 VAGOTOMY IN THE PREVENTION OF ULCERS AFTER PORTACAVAL SHUNT SURGERY IN RATS. *(Ger.)* Schumpelick, V.; Kauffmann-Mackh, G. (Surg. Clin., Univ. Hamburg, Germany). *Dtsch. Med. Wochenschr.* 99(38):1872-1877, 1974.

The effect of an end-to-side portacaval anastomosis on the incidence of stomach ulcers and the volume, pH, and total acidity of gastric juice was studied in male albino rats. The pylorus was ligated in all animals 14 days after shunt surgery or sham operations (laparotomy, clamping off of the vena cava and portal vein for 10 min, and ligation of the pyloric vein). The incidence of stomach ulcers and the area of these ulcers in mm^2/rat were significantly greater in animals with portacaval anastomoses than in sham-operated controls. The pH, volume, and total acidity of gastric juice were also significantly increased after shunt surgery. When rats underwent selective gastric vagotomy before pyloric ligation, neither rats with portacaval anastomoses nor controls developed gastric ulcers, but the pH of gastric juice was still significantly higher after shunt surgery than after sham operation. These findings suggest that development of ulcers in patients with portacaval shunts might be prevented by combining shunt surgery with selective gastric vagotomy.

5289 FURTHER OBSERVATIONS ON SOME GASTROINTESTINAL EFFECTS OF 3,3'-DIHYDROXYDIBUTYL ETHER. *(It.)* Impicciatore, M.; Chiavarini, M.; Bertaccini, G. (Inst. Pharmacol., Univ. Parma, Italy). *Ateneo Parmense* [*Acta Biomed.*] 45(1-2):17-28, 1974.

5290 CHANGES IN THE NITROGEN FRACTIONS OF CHYME IN THE STOMACH AND SMALL INTESTINE WHEN FOODS WERE ADMINISTERED IN VARIOUS PARTS OF THE GASTROINTESTINAL TRACT. *(Rus.)* Berkos, O. V.; Shedrunov, V. V. (I. P. Pavlov Inst. Physiol, Leningrad, USSR). *Biull. Eksp. Biol. Med.* 79(2):8-11, 1975.

5291 COMPENSATORY INCREASE IN CHOLINE ACETYLTRANSFERASE ACTIVITY IN SALIVARY GLANDS AND DIAPHRAGM MUSCLE OF THE RAT. *(E.)* Ekstrom, J. (Inst. Physiol., Univ. Lund, Sweden). *Acta Physiol. Scand.* 93(4):525-530, 1975.

5292 STUDIES ON 5'-NUCLEOTIDASE HISTOCHEMISTRY. III. 5'-NUCLEOTIDASE ACTIVITY IN SMOOTH MUSCLE CELLS OF THE RAT'S GASTROINTESTINAL TUBE. *(E.)* Klaushofer, K.; Pavelka, M. (Dep. Micromorphol., Univ. Vienna, Austria). *Histochemistry* 43(4):373-385, 1975.

5293 STUDIES OF ALBUMIN METABOLISM IN DOGS USING ^{51}Cr- and ^{125}I-LABELED ALBUMIN. *(E.)* Kallfelz, F. A.; Wallace, R. J. (New York State Vet. Coll., Cornell Univ., Ithaca). *Am. J. Dig. Dis.* 20(6):594-595, 1975.

5294 METHOTREXATE EFFECTS ON ENTERIC MUCOSA, LIVER AND PANCREAS OF NORMAL AND BLED RATS. *(E.)* Celle, G.; Dodero, M.; Pannacciulli, I.; Fresco, G.; Mansi, C.; Savarino, V.; Bogliolo, G. (Dep. Int. Med., Univ. Genova, Italy). *Eur. J. Cancer* 11(5):317-320, 1975.

5295 METABOLITES OF 5-^{3}H-CYCLOCYTIDINE IN MONKEYS GIVEN SINGLE INTRAVENOUS INJECTION. *(E.)* Hamada, F.; Sugihara, T.; Tsuyama, S.; Hirayama, H.; Kanai, T.; Nishimura, M.; Kuretani, K.; Hoshi, A. (Dep. Vet. Pharmacol., Univ. Tokyo, Japan). *Chem. Pharm. Bull.* 23(3):586-591, 1975.

SECRETION AND METABOLISM

Stomach

5296 THE INTESTINAL PHASE OF GASTRIC SECRETION.

(E.) Kester, R. C. (Ninewells Hosp., Dundee, Scotland). *Ann. R. Coll. Surg. Engl.* 56(5):231-245, 1975.

The kinetics of hormone release were studied following the application of a stimulus to the intestine, in order to pinpoint the time of maximum hormone concentration in portal blood for subsequent isolation of the hormone. Samples of portal blood were obtained from intestinally-fed donor dogs over 15 min, starting at the following intervals after the start of the meal: 15 min (11 animals); 30 min (17); 45 min (10) and 90 min (10). The animals were subjected to antrectomy, splenectomy, construction of a Heidenhain pouch, gastroduodenostomy, and a Roux-en-Y jejunocutaneous fistula. After 3 weeks, an end-to-side portacaval shunt was performed and an indwelling catheter was placed in the portal vein. To assay histamine activity, Heidenhain pouches were constructed in dogs and tests were performed every 4-6 weeks. Weanling pigs were provided with Heidenhain pouches and acid secretory responses were determined at 1/2 hr intervals for a control basal hour and for 4 hr after a standard oral meal. The intestinal phase hormone was released within 30 min of the application of a stimulus and rapidly reached peak concentration in the portal blood. I.v. infusion into a donor dog of active portal plasma from a shunted, intestinally-fed dog stimulated gastric acid secretion after a delay of approximately 1 hr, and required a mean of 1.5 hr to stimulate peak secretion, which suggests that intermediate steps may be necessary before the hormone can effectively stimulate the parietal cell mass. The pig developed portacaval shunt-related gastric acid hypersecretion in response to food comparable to that observed in the dog and in man. There was also a brief delay in gastric acid secretion after administration of crude intestinal extract, again indicating that some intermediate reactions must occur. In addition, it is suggested that pig jejunal mucosa is an appropriate source for isolation of the intestinal phase hormone.

5297 HEPATIC RESECTION AND GASTRIC SECRETION.

(E.) Pinkerton, Jr., J. A.; Adkins, Jr., R. B.; Gobbel, Jr., W. G.; Foster, J. H. (Veterans Adm. Hosp., Nashville, Tenn.). *Am. Surg.* 41(6): 347-351, 1975.

Gastric acid secretion was studied in six dogs with Heidenhain pouches before and after 60-70% hepatectomy. In 5/6 dogs, hepatectomized gastric secretion was decreased 14-70% ($p<0.02$) following a high protein meal. One dog, which showed increased secretion, was found at autopsy to have a gastric stricture at the site of pouch construction. Conventional liver function tests were transiently abnormal in all dogs postoperatively. Autopsy revealed hyperplasia of remaining hepatic tissue but no gastric or duodenal ulceration in all dogs. These results indicate that hepatic tissue remaining after 60-70% hepatectomy is able to detoxify gastric secretagogues in the portal venous blood sufficiently so that gastric acid secretion is not affected.

5298 EFFECTS OF VAGOTOMY ON URECHOLINE MODIFIED HISTAMINE DOSE RESPONSES IN DOGS. *(E.)*

Hirschowitz, B. I.; Hutchison, G. A. (Univ. Alabama Med. Cent., Birmingham). *Am. J. Physiol.* 228(5): 1313-1318, 1975.

Histamine incremental step-dose response studies were performed in nine dogs with gastric cannula and Komarov esophagostomy. Histamine (2-100 μg/kg-hr) in six successive 45 min steps was infused in four separate studies on each dog. In three dogs, step-dose responses were repeated after vagotomy. In both groups of dogs the dose responses were then studied against background i.v. infusions of urecholine (10, 20, 40, and 80 μg/kg-hr). Vagotomy acted as a competitive inhibitor (K_m doubled from 14 to 29 μg/kg-hr, while V_{max} was unchanged), and this effect could be reversed by <10 μg of urecholine/kg-hr. In both groups, increasing backgrounds of urecholine increased the V_{max} from about 14 meq of H^+/30 min to about 23-24 meq/30 min, and decreased histamine K_m from 14 μg/kg-hr to about 1-2 μg/kg-hr. Both changes were log linear. The effects of urecholine on histamine-stimulated H^+ secretion thus showed synergism (decreased K_m) and potentiation (increased V_{max}); the former was interpreted as a cholinergic effect on the parietal cell histamine receptors and the latter as the probable existence of spare cholinergic receptors not normally accessible to histamine. There were no intrinsic qualitative or quantitive differences in these responses between the vagotomized and innervated stomachs. These results support the use of vagotomy to reduce gastric secretion in patients with duodenal ulcer.

5299 SIGNIFICANCE OF GASTRIC SECRETORY CHANGES IN THE PATHOGENESIS OF STRESS ULCERS.

(E.) Hase, T.; Anderson, P. R.; Mehlman, B. (Walter Reed Army Med. Cent., Washington, D.C.). *Am. J. Dig. Dis.* 20(5):443-449, 1975.

Gastric secretory patterns, plasma corticosterone levels and blood glucose concentrations were analyzed in fasted, rotationally stressed (60 rpm, 2 hr) male albino rats 3 hr after pyloric ligation. Gastric secretion was highest in controls, intermediate in stressed rats that developed ulcers, and lowest in stressed rats that did not develop ulcers. Neither high nor low gastric secretion correlated with stress-ulcer formation. When initial mucosal ischemia and secretory inhibition, which occurred in all stressed rats, were considered, those that developed ulcers manifested gastric hypersecretion when compared with those that did not develop ulcers. Mean plasma corticosterone was highest in stressed rats that developed ulcers, next highest in stressed rats that did not develop ulcers, and lowest in control rats. Compared with normal rats, mean blood glucose was lowest in stressed rats and highest in controls. Hypoglycemic changes were more marked in stressed rats that developed ulcers than in stressed rats that did not develop ulcers. It is suggested that focal mucosal ischemic changes in the presence of hypoglycemia and resultant gastric hyperacidity favor ulcer formation in stressed animals.

5300 OXYGEN TENSION OF THE CANINE GASTRIC MUCOSA UNDER THE INFLUENCE OF VASOACTIVE AND ACID STIMULATING AGENTS AND FOLLOWING VAGOTOMY.

(E.) Hartel, W.; Alken, P.; Linder, M. M. (Surg. Hosp. Infirm., Northwest Frankfurt am Main, Germany). *Bull. Soc. Int. Chir.* 33(5-6):417-421, 1974.

As a measure of microcirculation, oxygen tension was determined in male and female mongrel dogs under the influence of various pharmacologic agents and vagotomy. Fasted, anesthetized animals were subjected to a subdiaphragmatic total vagotomy or were injected i.v. with norepinephrine (2.5 and 5 μg/kg), naftidrofuryl (2-3 mg/kg), or pentagastrin (0.5-5 μg/kg). Central venous and arterial blood pressure and oxygen tension from the gastric antral mucosa were continuously recorded. I.v. norepinephrine caused a short but marked drop in the gastric mucosal oxygen tension, while naftidrofuryl increased the gastric mucosal oxygen tension in spite of a fall in the arterial blood pressure. Pentagastrin caused a temporary rise in oxygen tension followed by a more prolonged decrease. Vagotomy produced a moderate and more persistent drop in the mucosal oxygen tension. It is suggested that the naftidrofuryl-induced rise in mucosal oxygen tension was most probably caused by vasodilatation or, possibly, by an inhibition of cellular metabolism. The effects of pentagastrin can be explained in terms of an early vasodilatative effect, followed by a later onset of increased metabolic activity with high oxygen consumption.

5301 ADENYLATE CYCLASE AND PHOSPHODIESTERASE IN THE RAT GASTRIC MUCOSA AFTER STARVATION, FEEDING AND PENTAGASTRIN.

(E.) Ruoff, H. J.; Sewing, K. Fr. (Pharmacol. Inst., Univ. Tubingen, Germany). *Naunyn Schmiedebergs Arch. Pharmacol.* 288(2-3):147-153, 1975.

The effects of starvation, feeding, and pentagastrin on the gastric mucosal activities of adenylate cyclase and phosphodiesterase were studied in female Wistar rats. The rats were killed after 24- or 48-hr starvation which was, in some cases, followed by a period of refeeding, or after a single i.v. injection of pentagastrin (125 μg/kg). The mucosa from the fundus of the stomach was removed and homogenized and assayed for adenylate cyclase and phosphodiesterase. Starvation for 24 or 48 hr reduced both the basal and NaF-stimulated activities of adenylate cyclase without affecting the activity of phosphodiesterase. Refeeding of starved rats slowly raised the adenylate cyclase activity to up to 430% of basal values within 4 hr; this effect was more pronounced under basal conditions than with NaF stimulation. Pentagastrin caused a stimulation of basal adenylate cyclase lasting 45 min; this was followed by a subsequent decrease in the basal and NaF-stimulated enzyme activity. Phosphodiesterase activity was not influenced by refeeding but was transiently inhibited by pentagastrin. The results indicate that the gastric mucosal cyclic AMP levels after starvation, feeding, and pentagastrin are regulated by adenylate cyclase, not phosphodiesterase. The rise in adenylate cyclase activity after refeeding appears to be related to functions other than H^+ and pepsin secretion.

5302 EFFECTS OF ETHANOL ON GASTRIC ACID SECRETION AND GASTRIC MUCOSAL CYCLIC AMP IN THE RAT.

(E.) Puurunen, J.; Karppanen, H. (Dep. Pharmacol., Univ. Oulu, Finland). *Life Sci.* 16(10): 1513-1520, 1975.

The effect of ethanol on the secretion of gastric acid and on the content of cyclic AMP in the gastric mucosa was studied in male Sprague-Dawley rats. Ethanol was injected i.v. (10-800 mg/kg) or applied locally (1-10%) to the stomach for 5 or 25 min, after which gastric acid secretion was measured and the cyclic AMP content and activities of phosphodiesterase and adenyl cyclase in the glandular mucosa were determined. I.v. ethanol had no effect on the output of gastric acid, although there was a concentration-dependent decrease in acid secretion following local application. The latter effect was evident within 5 min; the rate of acid secretion decreased by about 30% with 1% ethanol and by 100% with 10% ethanol. Within 5 min of local application of 10% ethanol, the gastric mucosal content of cyclic AMP decreased by approximately 50%. A similar effect was observed *in vitro*; the decrease was about 30% with 2.5% ethanol, about 60% with 10% ethanol, and approximately 45% with 20% ethanol. In the presence of cyclic AMP (0.4-2μM), alcohol inhibited the activity of phosphodiesterase activity of the gastric mucosa in a competitive manner. The K_i-value was 0.16 M which would correspond to an alcohol concentration of 9.1%. In addition, ethanol caused a concentration-dependent inhibition of the activity of the gastric mucosal adenyl cyclase, the inhibition reaching nearly 100% with 0.166 M (9.4%) alcohol. It is concluded that the ethanol induced decrease of cyclic AMP in the gastric mucosa is due to a decreased formation of the nucleotide. The accompanying inhibition of acid secretion is consistent with the view that cyclic AMP is an intracellular regulator of gastric acid secretion. In view of the role of cyclic AMP in the control of cellular integrity, the ethanol-induced damage might also be at least partly due to the decreased mucosal concentration of cyclic AMP.

5303 PLASMA PROTEINS IN CANINE GASTRIC LYMPH.

(E.) Bruggeman, T. M. (Dep. Physiol., Univ. Michigan, Ann Arbor). *Gastroenterology* 68(5): 1204-1210, 1975.

A method for obtaining samples of gastric interstitial fluid *via* the collection of gastric lymph is described. Because it has not been possible to collect gastric lymph by the cannulation of lymph vessels, the methods of renal micropuncture were adapted to the collection and analysis of 0.5-3 μl samples obtained by puncturing lymph vessels on or immediately adjacent to the ventral surface of the dog's stomach. Samples of gastric lymph collected immediately after surgical exposure of the stomach were than subjected to acrylamide gel electrophoresis, and were found to show all the protein bands exhibited by simultaneously collected samples of plasma. Quantitative analysis of similar samples by cellulose acetate electrophoresis gave the following ratios of plasma:protein concentration in the gastric lymph: total protein, 0.51; albumin, 0.68; total globulins, 0.42; α_1-globulin, 0.49; α_2-globulin, 0.62; β-globulin, 0.35; fibrinogen, 0.39; and γ-globulin, 0.46. When samples were collected over 4-hr periods, the concentrations of all proteins in the lymph increased, a phenomenon which did not appear to be the result of increasing small pore size as the result of injury. When the mucosa was irrigated with solutions of dithiothreitol, a substance causing plasma shedding, the concentrations of proteins in the gastric lymph over a 4-hr period were similar to those found in control experiments. Gastric lymph mixed with 100 mN HCl was found to have proteolytic activity. The results suggest that albumin can leave gastric capillaries by restricted diffusion through small pores as well as by unrestricted diffusion through large pores.

5304 CHRONIC ALCOHOLISM AND ENDOGENOUS GASTRIN.

(E.) Treffot, M. J.; Tiscornia, O. M.; Palasciano, G.; Hage, G.; Sarles, H. (Unit Res. Dig. Pathol., Marseille, France). *Am. J. Gastroenterol.* 63(1):29-32, 1975.

The effects of a meat meal with or without ethanol infusion on serum gastrin levels were studied in dogs chronically treated with ethanol. Six of 10 dogs with chronic pancreatic and gastric fistulas were given 50% ethanol (2.0 mg/kg) daily for 1 yr; the remaining animals were given no alcohol (controls). After an 18-hr fast, the dogs were fed 150 g of raw meat alone or in association with 50% ethanol. Blood samples were collected 5, 15, 30, 45, 60, 90, and 120 min later. After the meat meal alone, the gastrin blood levels increased more quickly and remained elevated longer in the dogs chronically treated with ethanol than in the control dogs; this difference reached a peak of 40% after 90 min. The gastrin blood values were also higher in the ethanol-treated dogs following the ingestion of meat with concomitant infusion of ethanol; this difference reached a maximum of 86% after 30 min. The percentage increase in serum gastrin in the nonalcoholic dogs was greater and longer lasting following the ingestion of meat alone. The results suggest that ethanol is effective in releasing gastrin from the antrum. They also suggest that chronic ethanol intoxication increases the storage of gastrin in and its release from the antrum, a phenomenon which would explain the increased parietal cell mass and gastric acid secretion shown by animals subjected to chronic alcohol intoxication.

5305 EFFECT OF VAGAL INNERVATION ON THE SECRETORY RESPONSES OF CANINE GASTRIC POUCHES EXPOSED TO BILE.

(E.) Aubrey, D. A.; Burns, G. P. (Dep. Surg., State Univ. New York, Buffalo). *Am. J. Surg.* 129(5):518-522, 1975.

The secretory changes resulting from exposure of vagally innervated and vagally denervated canine fundic pouches to ox bile prior to a meat meal were studied. Male and female mongrel dogs were prepared with standard vagally denervated (Heidenhain) pouches or with similar pouches in which the anterior vagus nerve was preserved intact. Basal gastric secretions were measured in the fasted animals, after which a standard meat meal was administered and the gastric juice was collected in 15-min samples for 4 hr. In subsequent tests, the secretory responses of the pouches were assessed after preliminary exposure (30 min) to ox bile at pH 7 and pH 2. In the denervated pouches, the secretion patterns were similar after the meat meal alone (control) and after exposure of the pouches to bile at pH 7; however, the output of Na^+ was consistently higher in the pouches exposed to bile at pH 7 than in the control pouches. In the denervated pouches exposed to bile at pH 2, the output values for H^+, Cl^-, and K^+ were significantly lower than control values, while the output of Na^+ was significantly higher. The output of Na^+ and H^+ in the pouches exposed to bile at pH 2 was also significantly different from the output in the pouches exposed to bile at pH 7. The secretory volumes did not differ among the three groups. In the innervated pouches, the output of H^+ after exposure to bile at pH 7 was significantly reduced below control values and the output of Na^+ was significantly increased; these changes were more marked in the innervated pouches than in the denervated pouches. After exposure to bile at pH 2, the output of H^+ was more reduced in the secretions from the innervated pouches than in those from the denervated pouches, while the increase in Na^+ output was greater in the innervated pouches. The results suggest that the innervated mucosa is more susceptible than the denervated mucosa to the injurious effects of bile.

5306 EFFECT OF GASTRIC ALKALINIZATION ON LOWER ESOPHAGEAL SPHINCTER PRESSURE AND SERUM GASTRIN.

(E.) Kline, M. M.; McCallum, R. W.; Curry, N.; Sturdevant, R. A. L. (Veteran's Admin. Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterology* 68(5):1137-1139, 1975.

The effect of alkaline intragastric pH on the lower esophageal sphincter pressure (LESP) and on the serum gastrin concentration was measured in eight men without esophageal disease. After an overnight fast, four-lumen polyvinyl tube assemblies with four lateral orifices were fitted into the subjects. A 0.1 N $NaHCO_3$ solution (110 ml) or a control solution was administered *via* gastric instillation and the LESP and intragastric pH were measured both before and after administration. The serum gastrin concentration was also measured before and at 5, 10, and 20 min after administration. The mean basal LESP was 16.7 mm Hg and the mean basal gastrin concentration was 21.6 fM/ml. Both parameters increased during administration of the solutions, but these increases were not significant; nor were there any significant differences between the LESP and serum gastrin measurements during instillation of the alkaline and control solutions. The gastric pH was greater than 7.0 during administration of the $NaHCO_3$ solution and between 2.0 and 6.9 during most of the control periods. It is concluded that intragastric alkalinization does not increase total radioimmunoassayable serum gastrin or LESP in man.

5307 INTERACTION OF CALCIUM AND MAGNESIUM ON GASTRIC ACID SECRETION AND SERUM GASTRIN CONCENTRATION IN MAN.

(E.) Christiansen, J.; Rehfeld, J. F.; Stadil, F. (Bispebjerg Hosp., Copenhagen, Denmark). *Gastroenterology* 68(5):1140-1143, 1975.

The effect of magnesium on calcium- and pentagastrin-induced gastric acid secretion and on calcium-induced gastrin secretion were studied in healthy male and female volunteers. Levin tubes were placed in the subjects' stomachs and saline was administered i.v. for a control period of 1 hr. Calcium gluconate (30 ml/hr) or pentagastrin (0.5 µg/kg-hr) was infused i.v. over the next 3 hr; i.v. infusion of magnesium sulfate (30 mg/hr) was begun after 2 hr. Calcium gluconate increased the serum gastrin concentration as well as the gastric volume secretion, acidity, and acid output. The addition of magnesium sulfate to the infusate caused a slight but insignificant increase in serum gastrin concentration, whereas volume secretion, acidity, and acid output were significantly depressed. Magnesium sulfate had no effect on the gastric acid secretion induced by a submaximal pentagastrin infusion. These results indicate that magnesium antagonizes the activation of gastric acid secretion by calcium without suppressing gastrin release and may suggest that magnesium does not change the sensitivity of the parietal cell to gastrin.

5308 ACTION OF THE ANTI-INFLAMMATORY AGENTS, ACETYLSALICYLIC ACID, INDOMETHACIN AND FENOPROFEN ON THE GASTRIC MUCOSA OF DOGS.

(E.) Lin, T. M.; Warrick, M. W.; Evans, D. C.; Nash, J. F. (Lilly Res. Lab., Eli Lilly Co., Indianapolis, Ind.). *Res. Commun. Chem. Pathol. Pharmacol.* 11(1):1-14, 1975.

The effects of acetylsalicylic acid (ASA), indomethacin, and fenoprofen on the integrity of the gastric mucosal barriers were measured by ionic fluxes into the gut lumen of three dogs with Heidenhain pouches. HCl (0.1 N, 30 ml) was infused into the pouches and removed at 30-min intervals for 6 hr. During the third and fourth periods, the acid instillate contained 4.5 mg/ml or 12.5 mM of ASA, indomethacin, or fenoprofen. All three agents affected the functional integrity of the mucosal barrier, but the characteristics of their actions differed. The H^+ concentration was decreased by ASA and fenoprofen and was increased by indomethacin, while all three drugs increased the net flux of Na^+, K^+, Ca^{++}, and Mg^{++}. Following initial augmentation of the instillate volume and H^+ concentration, indomethacin caused sustained back diffusion of acid from the lumen to the mucosa; this was accompanied by mucosal bleeding. The peak effects of ASA on the net ionic flux occurred during or immediately after drug infusion and were greater than those of indomethacin and fenoprofen. Fenoprofen at 12.5 mM had no effect on the concentrations of Ca^{++} or Mg^{++}, whereas both were significantly increased by equal molar doses of ASA or indomethacin. In onset of action, indomethacin was slow, but once disruption of functional integrity started, it continued for hours, showing no signs of returning to normal. In this sense, the total disruptive action of an equal weight or molar dose of indomethacin was greater than that of ASA or fenoprofen. At pH 1, the absorption of ASA from the Heidenhain pouch was greater than that of indomethacin or fenoprofen, their respective peak concentrations in the plasma being 53.9, 14.2, and 13.7 µM. The results suggest that fenoprofen may be less irritating and less ulcerogenic than ASA and indomethacin in the acid secreting stomach when the drugs are taken orally.

5309 EFFECT OF THE H_2-RECEPTOR ANTAGONISTS (BURIMAMIDE AND METIAMIDE) ON GASTRIC SECRETION STIMULATED BY HISTAMINE AND ITS METHYL DERIVATIVES.

(E.) Preiss, D. U.; Code, C. F. (Mayo Clin., Rochester, Minn.). *J. Pharmacol. Exp. Ther.* 193(2):614-620, 1975.

The comparative effectiveness of burimamide and metiamide as antagonists of gastric secretion stimulated by histamine and its methyl derivatives, N^{α}-methylhistamine, N^{α},N^{α}-dimethylhistamine and 4-methylhistamine, was studied in dogs with vagally denervated (Heidenhain pouches) and vagally innervated gastric mucosal septal pouches (Pavlov pouches). The secretagogues were given by continuous i.v. infusion to produce steady states of secretory activity in the fasted conscious dogs; the antagonists were given by either rapid bolus i.v. injection or continuous i.v. infusion. With bolus injections, both antagonists promptly inhibited the secretion produced by histamine and its methyl derivatives. At similar control secretory rates, 40 µM/kg burimamide and 4 µM/kg metiamide produced the same degree of inhibition. When the antagonists were given by continuous i.v. infusion, the difference between them was greater, metiamide being 15-17 times more potent than buriamamide. The effectiveness of the antagonists was not changed by vagal denervation. Symptoms of toxicity to burimamide developed at doses in excess of 30 µM/kg/hr; none occurred with metiamide at 1.8-7.5 µM/kg/hr. In addition to establishing the greater potency of metiamide, the continuous i.v. infusion experiments revealed differences in the action of histamine and N^{α}-methylhistamine. With histamine providing the background secretion, the dose of buriamamide necessary to produce 50% inhibition was 14.7 times greater than that of metiamide; when N^{α}-methylhistamine was the agonist, the multiple was 16.7. The results suggest a stronger binding by N^{α}-methylhistamine than by histamine to the H_2-receptor and supports the contention that histamine and N^{α}-methylhistamine have different affinities for the H_2-receptor of the parietal cell.

5310 TOPICAL CALCIUM AND pH EFFECT ON GASTRIN RELEASE AND PARIETAL CELL SECRETION. *(E.)* McLaughlin, M. H.; Peskin, G. W.; Greenburg, A. G.; Saik, R. P. (Univ. Calif. Sch. Med., San Diego). *J. Surg. Res.* 18(4):427-430, 1975.

The effects of topical Ca^{++} and the pH effects of its delivery vehicle on antral gastrin release and parietal cell secretion were studied using the following solutions: CaCl$_2$ (pH 2 and pH 8, 300 mOsm); NaCl (pH 2 and pH 8, 300 mOsm). Integrated gastrin output and total acid output were calculated for each 45-min test period in the 36 cats studied. Both the fundus and the antrum were perfused with the test solutions to differentiate the effects of Ca^{++} and the pH changes on the system. Antral perfusion failed to consistently alter gastrin output regardless of pH or ion involved. No significant increase in acid production was noted after either Ca or alkaline stimulation of the antrum. Topical perfusion of the fundus with alkaline solutions caused increased acid secretion without elevated gastrin output, and Ca produced a significantly greater acid response than Na. It is suggested that direct topical and reflex effects on the parietal cell may play an important role in gastric acid secretion stimulated by ingestion of food and may be more significant than small physiologic changes in serum gastrin levels.

5311 EFFECT OF ATROPINE IN REDUCING PLASMA PROTEIN SHEDDING BY THE CANINE OXYNTIC GLANDULAR MUCOSA INDUCED BY TOPICAL IRRIGATION WITH HISTAMINE OR COBRA VENOM. *(E.)* Kauffman, Jr., G. L.; Davenport, H. W. (Dep. Physiol., Univ. Michigan, Ann Arbor). *Gastroenterology* 69(1):198-199, 1975.

The mucosa of a vagally denervated (Heidenhain) pouch of the oxyntic glandular area of the stomachs in two dogs was irrigated for 30 min with dodecyl sulfate (20 mM solution in 15 mM phosphate buffer, pH 7.4) to break the gastric mucosal barrier. The mucosa was then irrigated for 30 min with histamine (1 mg/ml) solution. The experiment was repeated six times, during three of which the dogs were given i.v. atropine (0.0125 mg/kg) 15 min before the histamine solution was applied. Plasma shedding was very much lowered when histamine irrigation was preceded by atropine administration. A vagally denervated pouch of another dog was irrigated once weekly with a solution of lyophilized venom of *Naja naja* (0.5 mg/ml in phosphate buffer, pH 7.4). At the fourth week the characteristic response to the venom occurred. For 8 weeks thereafter, irrigation with venom preceded by i.v. injection of atropine (0.1 mg/kg) was alternated with irrigation without atropine. Atropine greatly reduced, but did not abolish, plasma shedding induced by venom irrigation. Plasma shedding induced by topical irrigation with 30% v/v ethanol in phosphate buffer, pH 7.4, was not affected by i.v. atropine (0.0125 mg/kg). These data allow the conclusion that plasma shedding exhibits a cholinergic component.

5312 EFFECT OF THE ANTRUM AND VAGUS NERVE ON BETAZOLE STIMULATION OF THE RAT STOMACH IN PERFUSION EXPERIMENTS. *(Ger.)* Hantschmann, N. (Surg. Clin., Univ. Kiel, Germany). *Arzneim. Forsch.* 25(2):216-222, 1975.

In perfusion tests the effect of a single injection of betazole (50 mg/kg s.c.) was studied in fasting male Wistar rats which had undergone bilateral truncal vagotomy, vagotomy and pyloroplasty, or antrectomy. Unoperated rats served as controls, and the completeness of vagotomy was tested with insulin in all cases. When vagotomy was performed immediately before the perfusion test, no change occurred in the betazole-induced increase in gastric acid secretion. However, when vagotomy was performed at least four weeks before the perfusion test, betazole produced a very slow increase in acid secretion. Maximum values, attained 4 hr after injection, were half those obtained in unoperated controls and rats subjected to vagotomy immediately before the perfusion test. All but three of the 16 rats in this group had gastric dilatation and, despite a 24-hr fast, large quantities of food, hair, and dirt in their stomachs. Dilatation persisted, even after thorough rinsing of the stomach. To rule out the possibility that gastric dilatation affects acid secretion, truncal vagotomy was combined with pyloroplasty in 22 rats. Four or more weeks after surgery, betazole caused an increase in acid secretion which was just significantly above basal values within the first two hr after injection. Acid secretion then decreased, and basal values were reached 1 hr later. In 21 rats which had undergone antrectomy at least 4 weeks before the test, betazole produced a significant increase in acid secretion only 3 hr after injection, with maximum values being reached after 4 hr. When curves for rats subjected to vagotomy and pyloroplasty and those subjected to antrectomy alone were added, the resulting curves corresponded to those obtained on unoperated controls or on recently vagotomized animals during the first 3.5 hr of the perfusion test. These results suggest that betazole acts directly on the parietal cells and also produces cholinergic stimulation *via* the vagus nerve.

5313 COMPARISON OF THE EFFECT OF DIFFERENT FORMS OF A PROTEIN TEST MEAL ON GASTRIC ACID AND GASTRIN SECRETION. *(E.)* Ashby, D. B.; Himal, H. S. (Dep. Exp. Surg., McGill Univ., Montreal, Canada). *Am. J. Gastroenterol.* 63(4):321-323, 1975.

5314 DETERMINATION OF THE "BORDERLINE OF STASIS" IN PARIETAL CELL VAGOTOMY. PRELIMINARY EXPERIMENTAL STUDIES. *(E.)* Bone, J.; Brandsborg, O.; Brandsborg, M.; Mikkelsen, K.; Eriksen, P. O.; Amdrup, B. M. (Dep. Surg. Gastroenterol., Univ. Aarhus, Denmark). *Bull. Soc. Int. Chir.* 33(5-6):405-410, 1974.

5315 PHARMACOLOGICAL PROPERTIES OF N^1-PIPERONYL-N^4-3,7,11-TRIMETHYL-2,6,10-DODECATRIENYL-PIPERAZINE, A NEW NON-ANTICHOLINGERGIC GASTRIC ANTISECRETORY AGENT. *(E.)* Bianchetti, A.; Guarneri, L.; Biraschi, L. M.; Riva, M. (Dep. Pharmacol., Res. Lab., Milan, Italy). *Arzneim. Forsch.* 25(4):580-589, 1975.

5316 PRODUCTION OF GASTRIC AND ESOPHAGEAL TUMORS IN RATS BY METHYLNITROSOCYANAMIDE, A POSSIBLE CANDIDATE OF ETIOLOGIC FACTORS FOR HUMAN GASTRIC CANCER. *(E.)* Endo, H.; Takahashi, K.; Kinoshita, N.; Baba, T. (Cancer Res. Inst., Kyushu Univ., Fukuoka, Japan). *Proc. Jpn. Acad.* 50(7):497-502, 1974.

5317 INHIBITION OF RELEASE OF PROSTAGLANDINS AS AN EXPLANATION OF SOME OF THE ACTIONS OF ANTI-INFLAMMATORY CORTICOSTEROIDS. *(E.)* Lewis, G. P.; Piper, P. J. (R. Coll. Surg. Engl., London, England). *Nature* 254(5498):308-311, 1975.

5318 AGE AT MATERNAL SEPARATION AND GASTRIC EROSION SUSCEPTIBILITY IN THE RAT. *(E.)* Ackerman, S. H.; Hofer, M. A.; Weiner, H. (Montefiore Hosp., Bronx, N.Y.). *Psychosom. Med.* 37(2):180-184, 1975.

5319 ANTIULCEROGENIC PROPERTY OF SODIUM POLYACRYLATE ON EXPERIMENTAL ULCERATIONS IN RATS. *(E.)* Kokue, E.; Hayama, T.; Nakamura, T. (Tokyo Univ. Agric. Technol., Japan). *Jpn. J. Pharmacol.* 24(4):621-626, 1974.

5320 THE IMPORTANCE OF THE STOMACH IN GASTRIN-INDUCED HYPOCALCEMIA IN THE RAT. *(E.)* Schulak, J. A.; Kaplan, E. L. (Dep. Surg., Univ. Chicago, Ill.). *Endocrinology* 96(5):1217-1220, 1975.

5321 CHOLECYSTOKINETIC POTENCY OF GASTRIN IN UNANAESTHETIZED CAT. *(E.)* Vagne, M.; Audigier, J. C. (INSERM U-45, Lyon, France). *Rend. Gastroenterol.* 6(3):168-173, 1974.

5322 THE NEGATIVE FEEDBACK MECHANISM OF GASTRIC ACID SECRETION: SIGNIFICANCE OF ACID IN THE GASTRIC JUICE IN MAN AND DOG. *(E.)* Itoh, Z.; Takeuchi, S.; Aizawa, I.; Honda, R. (Gunma Univ. Sch. Med., Maebashi, Japan). *Surgery* 77(5):648-660, 1975.

5323 SALBUTAMOL: INHIBITION OF GASTRIC ULCERATION IN THE RAT. *(E.)* Fielding, L. P.; Router, M.; Curwain, B. P. (St. Mary's Hosp. Med. Sch., London, England). *Br. J. Surg.* 62(2):162-163, 1975.

5324 DIBENAMINE BLOCKADE ON GASTRIC ACID SECRETION IN VITRO AND ITS PROTECTION BY HISTAMINE ANTAGONISTS. *(E.)* Watanabe, K.; Goto, Y. (Dep. Pharmacometrics, Res. Inst. Wakan-yaku, Japan). *Eur. J. Pharmacol.* 30(2):133-139, 1975.

5325 ROLE OF INTRA- AND EXTRAGASTRIC FACTORS IN ACIDIC SECRETION OF STOMACH. *(Ukr.)* Skliarov, Y. P. (Med. Inst., Lvov, USSR). *Fiziol. Zh.* 21(1):14-23, 1975.

5326 THE EFFECT OF VAGOTOMY ON THE MICROCIRCULATION IN THE WALL OF THE STOMACH. *(Rus.)* Lakhtina, V. P.; Kozlov, V. I. (II Moscow N. I. Pirogov Med. Inst., USSR). *Biull. Eksp. Biol. Med.* 79(3):1-128, 1975.

5327 STIMULATION OF THE STOMACHS OF RATS WITH PENTAGASTRIN AFTER VAGOTOMY IN THE PERFUSION TECHNIQUE. *(Ger.)* Hantschmann, N. (Surg. Clin., Univ. Kiel, Germany). *Arzneim. Forsch.* 24(12): 2009-2015, 1974.

5328 THE EFFECT OF DIMETHYL 2(5-METHYL-4-IMIDAZOLYL)ETHYLAMINE(5-MeD) ON GASTRIC SECRETION IN THE CAT. *(It.)* Impicciatore, M.; Plazzi, V.; Mossini, F.; Chiavarini, M.; Bertaccini, G. (Inst. Pharmacol. Chem. Pharmacol., Univ. Parma, Italy). *Ateneo Parmense [Acta Biomed.]* 45(3):145-148, 1974.

5329 THE INFLUENCE OF VARIOUS ROUTES OF ADMINISTRATION ON THE EFFICACY OF THE GASTRIC INHIBITORY FACTOR IN THE RAT. *(Fr.)* Rouse, D.; Tetreault, L. (Hotel Dieu, Montreal, Canada). *Union Med. Canada* 104(6):970-975, 1975.

5330 PECULIARITIES OF CONDITIONAL AND UNCONDITIONAL REFLECTORY INFLUENCES UPON GASTRIC SECRETORY FUNCTION IN ELDERLY AND OLD PEOPLE. *(Ukr.)* Korkushko, O. V.; Kotko, D. N. (Acad. Med. Sci. USSR, Kiev, USSR). *Fiziol. Zh.* 21(1):57-62, 1975.

5331 THE ROLE OF GASTRINS IN PHYSIOPATHOLOGY OF THE STOMACH IN VIEW OF IMMUNOCHEMICAL STUDIES. *(Pol.)* Konturek, S. (Inst. Physiol., Med. Acad., Cracow, Poland). *Przegl. Lek.* 31(2):265-272, 1974.

5332 EFFECT OF METIAMIDE, AN ANTAGONIST OF HISTAMINE H_2-RECEPTORS, ON GASTRIC SECRETION. *(Pol.)* Konturek, S.; Demitrescu, T.; Radecki, T.; Dembinski, A.; Mitis, M. (Inst. Physiol., Med. Acad., Cracow, Poland). *Przegl. Lek.* 31(2):298-302, 1974.

5333 EFFECT OF CALCITONIN ON GASTRIC AND PANCREATIC SECRETION AND ON THE FORMATION OF EXPERIMENTAL PEPTIC ULCERS IN CATS. *(Pol.)* Radecki, T.; Konturek, S. J.; Thor, P.; Demitrescu, T.; Pucher, A. (Inst. Physiol., Med. Acad., Cracow, Poland). *Przegl. Lek.* 31(2):293-298, 1974.

5334 CYTOCHEMICAL AND ULTRASTRUCTURAL STUDY OF NONARGENTAFFIN GASTRIC ENDOCRINE CELLS OF THE RABBIT DURING ONTOGENESIS. *(Fr.)* Lefranc, G.; Pradal, G.; L'Hermite, A.; Dubin, J. C.; Tusques, J. (Fac. Med., Lab. Histol. Embryol., Nantes, France). *Ann. Histochim.* 19(3):157-172, 1974.

5335 ANTRAL CONTROL OF GASTRIC SECRETION. *(It.)* Monetti, G. (Univ. Bari, Italy). *Chir. Gastroenterol.* 7(2):220-257, 1973.

5336 ACUTE OVEREXERTION ON SECRETORY FUNCTION OF GASTRIC GLANDS. *(Ukr.)* Karpenko, L. N. (Med. Inst., Lvov, USSR). *Fiziol. Zh.* 21(1):41-44, 1975.

See also, 5207, 5213, 5232, 5272, 5287, 5590, 5609, 5610, 5798, 5800, 5848, 6489.

SECRETION AND METABOLISM

Pancreas

5337 ANALYSIS OF THE MECHANISM OF ACTION OF CALCIUM-INDUCED EXOCRINE PANCREATIC SECRETORY CHANGES IN THE DOG. *(E.)* Tiscornia, O.; Palasciano, G.; Dzieniszewski, J.; Verine, H.; Sarles, H. (Unit Res. Dig. Dis., Marseille, France). *Am. J. Gastroenterol.* 63(4):293-298, 1975.

To elucidate the role of the cholinergic system in the calcium-induced exocrine pancreatic secretory changes in the dog, an i.v. calcium infusion was superimposed on a continuous perfusion of secretin in dogs with and without an atropine-induced cholinergic blockade. GIH secretin (1 CU/kg/hr) was infused i.v. into mongrel dogs with gastric and duodenal fistulas (Thomas cannula); after 80 min, a second i.v. infusion of calcium (10 mg/kg) was begun and was continued for 60 min. In a second experiment, i.v. atropine infusion (1.5 mg/hr) was begun 80 min after the beginning of secretin infusion and calcium infusion was commenced 60 min later. In the absence of atropine-induced cholinergic blockade, i.v. calcium increased the flow rate, bicarbonate concentration and output, and protein concentration and output of the pancreatic juice; the greatest effects were on the protein concentration (increased by 148%) and output (increased by 173%). During atropine-induced blockade, i.v. calcium changed neither the flow rate nor the bicarbonate output of the secretin-induced pancreatic juice. On the other hand, i.v. calcium increased the protein concentration and output by 85% and 40%, resp., under these conditions. The results suggest that i.v. calcium enhances secretin-induced pancreatic secretion plateau values *via* two mechanisms: primarily by raising the cholinergic tone of the whole "pancreon"; and partially through a direct stimulus-secretion coupling effect on the acinar cells.

5338 MICROFILAMENTOUS SYSTEM AND SECRETION OF ENZYME IN THE EXOCRINE PANCREAS: EFFECT OF CYTOCHALASIN B. *(E.)* Bauduin, H.; Stock, C.; Vincent, D.; Grenier, J. F. (Fac. Med., Free Univ. Brussels, Belgium). *J. Cell Biol.* 66(1):165-181, 1975.

The influence of cytochalasin B (CB) on the exocrine function of the pancreas was studied *in vitro* using pieces of fasted adult rat pancreas. The pieces of pancreas were incubated in medium containing an L-amino acid mixture, D-glucose, buffer, and CB in ethanol solution. Parameters studied included the conversion of glucose into proteins and CO_2, the incorporation of glucose in the pancreatic pieces, sugar transport, the conversion of 2-deoxy-D-glucose to 2-deoxy-D-glucose-6-phosphate, calcium uptake, and the efflux of calcium. The pancreatic fragments were also studied by electron microscopy. The results showed that the microfilaments in the acinar cell are essentially located in the apical portion of the cell. Thin CB-sensitive microfilaments (50 Å) form the axis of the microvilli and a network lying beneath the apical membrane, while thicker filaments (100 Å), which are at least partly CB-insensitive, form bundles parallel to the plasma cell membrane and the desmosomal links. CB interaction with the aci cell of the exocrine pancreas involves at least tw sites: a membrane site involved in the inhibitory effect of CB on monosaccharide transport and a les sensitive site at the filamentous level which is a least partially responsible for the inhibitory eff of CB on the secretion of exportable enzyme from t pancreatic cell. CB did not alter the energy bala of the acinar cell or the exchanges of ^{45}Ca betwee the extracellular medium and the pancreatic tissue CB at 2 x 10^{-7} and 2 x 10^{-6} M had secretagogue pro erties, whereas at 2 x 10^{-5} M, it had an inhibitor effect on stimulated secretion and secretagogue pr erties. The mechanism of these secretory effects unknown. The data provide strong evidence for the involvement of the microfilamentous network in the last steps of the secretory cycle in the acinar ce of the exocrine pancreas.

5339 INCREASED PARATHYROID HORMONE SECRETION HYPOCALCEMIA IN EXPERIMENTAL PANCREATITI NECESSITY FOR AN INTACT THYROID GLAND. *(E.)* Norb H. P.; DeRoos, J.; Kaplan, E. L. (Univ. Chicago, Pritzker Sch. Med., Ill.). *Surgery* 77(6):773-779, 1975.

The role of the parathyroid and thyroid glands in the production of the hypocalcemia accompanying ac pancreatitis was studied in pigs. Acute pancreati was induced in thyroidectomized animals and in pig with intact thyroids; sham-operated pigs served as controls. Before and at various intervals for 48 after the induction of pancreatitis, arterial bloo samples were analyzed for blood urea nitrogen (BUN serum electrolytes, total protein, amylase, total cium, magnesium, phosphorus, and serum parathyroid hormone (PTH). The basal values for these paramet did not vary between normal, sham-operated, and th roidectomized pigs. After induction of pancreatit in the thyroid-intact pigs, however, serum amylase increased to more than 350% of the basal value, ar serum calcium concentrations significantly increas between 8-24 hr, thereafter returning to normal. Serum PTH concentrations also increased significar between 8-18 hr following the induction of pancrea titis, the peak PTH concentration (167% above basa values) occurring at 12 hr. Although serum amylas values also increased in the thyroidectomized pigs after the induction of pancreatitis, serum calcium and PTH did not vary from basal values. In all ar mals with acute pancreatitis, the serum magnesium, phosphorus, total proteins, BUN, and electrolytes mained within basal limits. The data support the view that calcitonin or another thyroid-related su stance plays a role in the mechanism of the hypoca cemia which accompanies experimental pancreatitis the pig.

5340 ACUTE HEMORRHAGIC PANCREATITIS (MASSIVE NECROSIS) WITH FAT NECROSIS INDUCED IN MICE BY DL-ETHIONINE FED WITH A CHOLINE-DEFICIENT DIET. *(E.)* Lombardi, B.; Estes, L. W.; Longneck D. S. (Univ. Pittsburgh Sch. Med., Pa.). *Am. J. Pathol.* 79(3):465-480, 1975.

The anatomicropathologic and ultrastructural alterations observed in the pancreatic tissues of mice fed DL-ethionine with a choline-deficient diet are described. Thirty-day-old female Swiss Webster mice were placed on choline-deficient diets (controls) or choline-deficient diets in which 0.5% DL-ethionine replaced an equal amount of sucrose (experimental animals). All experimental mice died within 5 days due to the development of an acute hemorrhagic pancreatitis with fat necrosis throughout the peritoneal cavity; none of the controls died within this time interval. The pancreatitis in the experimental animals was characterized by a massive necrosis of the exocrine parenchyma with intense hemorrhage and inflammatory reaction of the stroma. The sequence of histologic and ultrastructural alterations occurring in the acinar cells of the pancreas was studied in the controls and in mice fed the experimental diet for 1, 2, or 3 days. Pancreatic tissues of control mice were histologically normal. In those of mice fed the experimental diet for 1 day, acinar cells were intensely eosinophilic, and there were numerous zymogen granules and a considerable reduction in the amount of basal and perinuclear basophilia. After 2 days, the loss of basophilia was almost complete; there were numerous, small, cytoplasmic vacuoles, primarily in the basal portions of the cells; and the pancreatic stroma showed a moderate degree of edema and congestion. The vacuolation of the acinar cells became more extensive after 3 days and cellular necrosis was evident; the interstitial edema and congestion were more severe. The pancreatitis in the experimental mice appeared to be due to intraparenchymal activation of zymogens, resulting from a synergistic action of choline deficiency with the basic toxicity of ethionine toward pancreatic acinar cells. This experimental model closely simulates the acute hemorrhagic pancreatitis with fat necrosis occurring in humans and may prove useful for exploring the pathogenesis of this condition.

5341 FACTORS INVOLVED IN THE INTESTINAL FEEDBACK REGULATION OF PANCREATIC ENZYME SECRETION IN THE RAT. *(E.)* Schneeman, B. O.; Lyman, R. L. (Dep. Nutr. Sci., Univ. California, Berkeley). *Proc. Soc. Exp. Biol. Med.* 148(3):897-903, 1975.

The mechanisms involved in the intestinal stimulation of pancreatic secretion were studied using male Wistar rats, prepared with bile-pancreatic or pancreatic and intestinal cannulas. Lyophilized soybean trypsin inhibitor (SBTI), trypsin, diisopropyl fluorophosphate (DFP)-treated trypsin, chymotrypsin, or DFP-chymotrypsin was infused into the intestine; in other experiments, pancreozymin, trypsin, SBTI, chymotrypsinogen, or cholecystokinin (CCK) was infused into the jugular vein. The bile-pancreatic juice was collected during the infusion studies and was analyzed for total protein and chymotrypsin using the synthetic substrate *n*-benzoyl-L-tyrosine ethyl ester. SBTI stimulated pancreatic enzyme secretion only when introduced into the upper third of the small intestine. In rats whose pancreatic juice had previously been diverted for 10 hr, both trypsin and chymotrypsin suppressed the pancreatic protein output in a dose-dependent fashion, maximal suppression being obtained with 10 mg of trypsin/0.5 hr. DFP-trypsin and DFP-chymotrypsin had no such effect. The inhibitory effect of trypsin occurred only when the enzyme was infused into the upper third of the intestine. Trypsin, chymotrypsinogen, and SBTI had no significant effect on the pancreatic output when infused directly into the jugular vein. CCK infusion significantly increased the pancreatic enzyme output in rats whose pancreatic juice had been continually returned to the intestine; this increase was much smaller when the juice had been diverted for the preceding 10 hr. The results suggest that trypsin in the upper small intestine somehow prevents the release of CCK into the blood and that SBTI releases CCK by binding the trypsin and removing it from the intestine. Trypsin and chymotrypsin appear to exert their feedback regulation of pancreatic secretion in intestine.

5342 ENTEROPANCREATIC CIRCULATION OF DIGESTIVE ENZYMES. *(E.)* Liebow, C.; Rothman, S. S. (Cornell Univ. Med. Coll., New York, N. Y.). *Science* 189(4201):472-474, 1975.

The possible existence of a cycle involving the absorption of intact digestive enzymes by the intestine and their resecretion by the pancreas was investigated. Whole rabbit pancreases were excised and placed in an organ both containing bovine (^{3}H)chymotrypsinogen and human (^{131}I)albumin. The pancreatic duct was cannulated and the secretion was collected directly. The chymotrypsinogen concentrations in the secretion continued to rise for 1 to 2 hr before a steady-state secretory concentration was reached; about 3% of the chymotrypsinogen was of exogenous origin. The transpancreatic movement of this enzyme appeared to occur at least in part *via* an intracellular route. In another experiment, cholecystokinin-pancreozymin was added to the organ bath after (^{3}H)-labeled rabbit amylase (previously added) had achieved a steady-state concentration in the pancreatic secretion. After the addition of the hormone, the concentration of (^{3}H)amylase in the secretion rose markedly. In a further set of experiments, the mucosal to serosal flux of (^{3}H)chymotrypsinogen relative to that for (^{131}I)albumin was compared in gut sacs prepared from rabbit ileum. The permeability of the ileal membrane to chymotrypsinogen expressed per unit of concentration gradient was about 9-fold greater than that for albumin. Finally, to directly examine the circulation of enzyme, (^{3}H)chymotrypsinogen was placed in the intestine just down-stream from the intestinal opening of the pancreatic duct and the pancreatic secretion was collected from the cannulated duct. The ^{3}H chymotrypsinogen peaked in the secretion within 15 min; about 67% of the secreted label comigrated with bovine chymotrypsinogen under disc gel electrophoresis. The results indicate the existence of an enteropancreatic circulation for at least some digestive enzymes, although the magnitude of this process remains uncertain. In addition, the fluxes observed across the pancreas and intestine were of sufficient magnitude to indicate the possibility of a conservation mechanism.

5343 EFFECT OF OXYTETRACYCLINE AND CHLORAMPHENICOL ON THE EXOCRINE PANCREATIC FUNCTION IN THE RAT. *(E.)* Fleischer, K. (Med. Clin. Univ. Wurzburg, Germany). *Digestion* 11(5-6):382-391, 1974.

The effects of oxytetracycline and chloramphenicol pretreatment on pancreatic secretion under exogenous stimulation were studied in specific pathogen-free male rats of the Chbb: THOM strain. The animals were provided with bile-pancreatic cannulas and 12 days later were treated with oxytetracycline (20 mg/kg/hr, i.v. beginning 1 hr before the collection of pancreatic secretion, or 200 or 400 mg/kg/day, s.c. for 3 days prior to the collection of pancreatic secretion) or chloramphenicol (0.6 g/kg in 4% Tylose solution by stomach tube 12 hr before the collection of pancreatic secretion, or 0.6 or 1.2 g/kg/day for 3 days prior to the collection of pancreatic secretion). The serum antibiotic levels were determined in some animals. In others, pancreatic secretion was stimulated by the continuous i.v. infusion of 25 U/kg/hr of secretin and 25 U/kg/hr of pancreozymin. The protein and electrolyte concentrations and activities of amylase, trypsin, and lipase in the pancreatic secretion were measured. Short-term pretreatment with oxytetracycline or chloramphenicol produced no significant changes in the exogenously stimulated pancreatic secretion. However, after 3 days of pretreatment with either antibiotic, an approximately dose-dependent decrease in the exogenously stimulated pancreatic secretion was observed; this decrease was reflected in both the protein output and in the enzyme activities of the secretion. The volume and electrolyte output of the pancreatic secretion remained essentially unchanged. Immediately following the cessation of long-term antibiotic treatment, the serum oxytetracycline levels decreased steadily, while the serum levels of chloramphenicol decreased initially, and then remained relatively constant between 6 and 15 hr after treatment. Since short-term antibiotic treatment produced no changes in pancreatic secretion, the observed alteration after longer-term treatment appears to be largely attributable to a depression of enzyme protein synthesis.

5344 BIOCHEMICAL GENETICS OF α-AMYLASE ISOZYMES OF THE CHICKEN PANCREAS. *(E.)* Lehrner, L. M.; Malacinski, G. M. (Dep. Zool., Indiana Univ., Bloomington). *Biochem. Genet.* 13(1/2):145-173, 1975.

α-Amylase isozyme patterns and patterns of inheritance were studied in pancreatic tissue from phenotypically different chickens. In the chicken population at large, three electrophoretically distinct pancreatic α-amylase isozymes were discovered. The isozymes were designated Pa 1, Pa 2 and Pa 3. The local population of chickens, however, possessed only isozymes Pa 2 and Pa 3 (present as three phenotypes: Amy_2 B, consisting of isozyme Pa 2, Amy_2 BC, consisting of isozymes Pa 2 plus Pa 3 and Amy_2 C, consisting of isozyme Pa 3). Pancreatic biopsy permitted the establishment of a breeding flock with defined amylase phenotypes. Matings of this flock established that amylases are inherited as codominant alleles at a single genetic locus. Further, there was no evidence of ontogenetic modification of the amylase isozymes. It was observed that amylase isozymes Pa 2 and Pa 3 each generated a family of at least three faster-migrating amylolytic proteins. These post-translationally-modifed amylases were designated Pa Xa, Pa Xb, and Pa Xc, where X represents the number of the progenitor amylase. Structural analyses of purified amylases demonstrated that all amylase isozymes are nonglycosidated, monomeric molecules of molecular weight 55,000. In addition, the data are consistent with the hypothesis that the faster-migrating amylases are produced by deamination of asparagine and/or glutamine residues.

5345 MORPHOLOGICAL AND FUNCTIONAL STUDY OF EXOCRINE PANCREAS WITH IMPAIRED INNERVATION. *(Rus.)* Eletskii, Iu. K.; Osman, A. Iu. (2nd Moscow Med. Inst., USSR). *Arkh. Anat. Gistol. Embriol.* 68(2):49-56, 1975.

5346 COMPARATIVE CYTOLOGICAL AND GENETIC ANALYSIS OF THE DIFFERENTIATION OF THE PANCREAS EPITHELIUM OF CERTAIN VERTEBRATES AFTER FREE AUTOTRANSPLANTATION. *(Rus.)* Gerlovin, E. Sh. (Leningrad Sanit. Hyg. Med. Inst., USSR). *Arkh. Anat. Gistol. Embriol.* 68(1):13-24, 1975.

5347 ISOPROTERENOL-INDUCED PANCREATIC SECRETION IN THE RAT; A COMPARISON WITH SECRETIN. *(E.)* Roze, C.; de la Tour, J.; Souchard, M.; Chariot, J.; Vaille, C.; Debray, C. (Hosp. Bichat, Paris, France). *Digestion* 11(5/6):458, 1974.

5348 CHRONIC ALCOHOL FEEDING AND GASTRIN PHASE OF RAT EXOCRINE PANCREATIC SECRETION. *(E.)* Cavarzan, A.; Teixeira, A.; Palasciano, G.; Dzieniszewski, J.; Tiscornia, O.; Sarles, H. (INSERM, Marseille, France). *Digestion* 11(5/6):442, 1974.

5349 OUTPUT OF NEWLY SYNTHETIZED PROTEINS BY HUMAN PANCREAS. *(E.)* Robberecht, P.; Cremer, M.; Deltenre, M.; Christophe, J. (Fac. Med., VLB, Brussels, Belgium). *Digestion* 11(5/6):457, 1974.

5350 EFFECT OF IONOPHORE A 23187 ON AMYLASE SECRETION AND PHOSPHOLIPID METABOLISM IN THE RAT EXOCRINE PANCREAS. *(E.)* Calderon, P.; Furnelle, J.; Winand, J.; Christophe, J. (Fac. Med., Univ. Libre, Brussels, Belgium). *Arch. Int. Physiol. Biochim.* 83(2):353-419, 1975.

5351 INTRACELLULAR ASPECTS OF THE PROCESS OF PROTEIN SYNTHESIS. *(E.)* Palade, G. (Yale Univ. Sch. Med., New Haven, Conn.). *Science* 189(4200):347-358, 1975.

5352 PANCREATIC EXOCRINE SECRETORY PROTEINS. *(E.)* Greene, L. J. (Biol. Dep., Brookhaven Nat. Lab., Upton, N.Y.). *J. Surg. Oncol.* 7(2):151-154, 1975.

See also, 5197, 5208, 5229, 5287, 5294, 5333, 5425, 5455, 5574, 5609, 6047.

SECRETION AND METABOLISM

Hepatobiliary Tract

5353 BILE ACIDS SECRETION AND SYNTHESIS BY ISOLATED RAT HEPATOCYTES. *(E.)* Anwer, M. S.; Kroker, R.; Hegner, D. (Inst. Pharmacol., Toxicol. Pharm., Univ. Munich, Germany). *Biochem. Biophys. Res. Commun.* 64(2):603-609, 1975.

The synthesis and secretion of bile acids by isolated rat hepatocytes were studied. Hepatocytes were isolated from the livers of male Wistar rats and incubated in cell suspension. The supernatants were assayed for bile acids, lactate, pyruvate, and glucose and the results were compared with those obtained with bile samples collected *in vivo*. Bile acid secretion *in vitro* was linearly related to time for the first 3 hr of incubation; the net secretion rate was 23.2 mM/g of cells/min. The biliary excretion rate of bile acids by male Wistar rats has been reported to be 51.8 mM/g liver/min. The distribution of individual bile acids in the incubation media was significantly different from that in the *in vivo* bile samples. The ratio of taurine to glycine conjugates was significantly higher in the bile than in the incubation media; the ratio of dihydroxy to trihydroxy bile acids was significantly higher in the incubation media, and the ratio of chenodeoxycholic acid to cholic acid was higher in the incubation media than in the bile samples. The results indicate that isolated rat hepatocytes would provide a suitable experimental system for studying the effects of drugs and hepatic diseases on bile acid secretion and synthesis at the cellular level. The relatively higher synthesis of chenodeoxycholic acid in the hepatocytes could be used to study the mechanism controlling the relative proportion of primary bile acid synthesis from cholesterol.

5354 ANALYSIS OF REGULATORY FACTORS FOR UREA SYNTHESIS BY ISOLATED PERFUSED RAT LIVER. II. COMPARISON OF UREA SYNTHESIS IN LIVERS OF RATS SUBJECTED TO DIFFERENT DIETARY CONDITIONS. *(E.)* Saheki, T.; Tsuda, M.; Tanaka, T.; Katunuma, N. (Sch. Med., Tokushima Univ., Japan). *J. Biochem. (Tokyo)* 77(3):671-678, 1975.

The effects of dietary protein on urea synthesis and amino acid patterns in isolated, perfused rat liver were studied. Adult male Wistar rats were maintained for 4-24 days on 5% or 70% casein diets, after which their livers were perfused with medium with ammonium chloride as the nitrogen source. Urea formation in the livers of the rats fed the 70% casein diet was rapid and the efficiency of conversion of ammonia to urea was 97.9%. In contrast, urea formation in the livers of the rats fed the 5% casein diet was much slower and the efficiency of conversion of ammonia to urea was only 36.1%. In addition, the ratio of the rate of urea formation from ammonium chloride to the activity of ornithine transcarbamylase was much lower in the rats fed the low-protein diet than in those fed the high-protein diet. The addition of ornithine and *N*-acetylglutamate to the perfusate caused marked elevations in these ratios, two of which reached nearly the same level in both groups of rats. In the perfused livers from rats fed the 5% casein diet, a large portion of the ammonia added to the perfusate was fixed into an amino or an amide group of amino acids such as alanine, aspartate, and glutamine. In the perfused livers from the rats fed the 70% casein diet, most of the added ammonia was converted to urea. The results suggest that factors other than the amounts of urea cycle enzymes may play an important role in determining the flux through the urea cycle *in vivo*; these factors appear to be ornithine and *N*-acetylglutamate. The larger hepatic concentrations of nonessential amino acids in the rats fed the low protein diet may have resulted from the conversion of ammonia to nonessential amino acids; the fact that serine and glycine were not increased in the perfused livers suggests that their synthesis in the liver requires other factors or that they are converted rapidly into other compounds.

5355 METABOLISM OF RETINOL-BINDING PROTEIN AND VITAMIN A DURING HYPERVITAMINOSIS A IN THE RAT. *(E.)* Mallia, A. K.; Smith, J. E.; Goodman, D. S. (Columbia Univ. Coll. Physicians Surg., New York, N.Y.). *J. Lipid Res.* 16(3):180-188, 1975.

The effects of excess vitamin A on the plasma concentration and metabolism of retinol-binding protein (RBP) in the rat were studied. In the first experiment, weanling male Holtzman rats were given 0.14, 7.3, or 41 mg/day vitamin A, p.o., for 50-99 days. Plasma vitamin A and RBP levels were determined in samples obtained at various intervals between days 1 and 93. In the second study, adult Holtzman rats were given 0.14 or 34.4 mg retinal acetate daily for 23 days; these animals were also given daily p.o. doses of 0.67 μCi of ^{3}H-retinyl acetate. In both studies, administration of large, excessive doses of vitamin A resulted in substantial and significant decreases in the serum RBP levels. Excessive doses of vitamin A also produced fatty liver in association with a normal (in rats fed 7.3 mg vitamin A/day) or decreased (in rats fed 41 mg vitamin A/day) liver RBP concentration. In addition, the serum vitamin A levels were elevated in the animals fed excessive vitamin A, an effect which was due primarily to large increases in the circulating retinyl ester levels. In the hypervitaminotic rats, most of the serum vitamin A and virtually all of the retinyl esters were found in association with the serum lipoproteins of less than 1.21 hydrated density. The results indicate that the serum lipoproteins play an important role in the transport of the vitamin A which accumulates in the serum during excessive vitamin A intake. It is suggested that the toxic manifestations of hypervitaminosis A occur when vitamin A circulates in the plasma and is presented to the membranes in a form other than bound to RBP. Plasma lipoproteins may nonspecifically deliver vitamin A to biological membranes, thus leading to vitamin A toxicity.

5356 COBALT STIMULATION OF HEME DEGRADATION IN THE LIVER: DISSOCIATION OF MICROSOMAL OXIDATION OF HEME FROM CYTOCHROME P-450. *(E.)*

Maines, M. D.; Kappas, A. (Rockefeller Univ., New York, N.Y.). *J. Biol. Chem.* 250(11):4171-4177, 1975.

The relation of the cytochrome P-450 mixed function oxidase system to heme catabolism in liver cells was studied in rats. Male Sprague-Dawley rats were injected with cobalt chloride (60 mg/kg s.c.), cobalt protoporphyrin-IX or protoporphyrin-IX alone (4 μM/100 g i.p.), 3-amino-1,2,4-triazole (3 g/kg i.p.), or allylisopropylacetamide (400 mg/kg s.c.). In some cases, the animals also received i.p. injections of actinomycin D (0.06 mg/100 g or puromycin (2 mg/100 g). The rats were sacrificed after a 24-hr fast and liver microsomes analyzed for oxidative and δ-aminolevulinic acid synthetase activity. Cobalt chloride administration caused a marked increase in the oxidative degradation of heme (hematin, iron protoporphyrin-IX) beginning within 2 hr after cobalt treatment and reaching a maximum in 16-24 hr. During the rapid phase of stimulation, when heme oxidation was 450% above control values, there was a significant decrease in microsomal oxidative N-demethylation activity and in the microsomal heme content, with a nonsignificant decrease in the microsomal cytochrome P-450 concentration. Within 24 hr, the oxidative activity of the microsomal electron transport chain for drugs decreased to about 30% of control values and heme oxidation approached levels 800% above control. During this period there was a further decrease in the microsomal heme concentration, a significant decrease in cytochrome P-450, and an increase in the activity of δ-aminolevulinate synthetase. These parameters returned to normal within 72 hr. The effect of cobalt on heme oxidation could be inhibited by actinomycin D or puromycin administration; the effect could not be elicited by *in vitro* cobalt treatment of the microsomes nor attributed to any soluble cytoplasmic components. Cobalt protoporphyrin-IX was less effective than cobalt chloride in stimulating heme oxidation and protoporphyrin-IX alone had no effect. 3-Amino-1,2,4-triazole did not enhance hepatic heme oxidation while allylisopropylacetamide decreased it. The oxidative degradation of heme was not cytochrome P-450-dependent. The results exclude an obligatory role for cytochrome P-450 in the oxidation of heme compounds, although the possibility that this process is a heme-dependent oxidation is not ruled out.

5357 PREREPLICATIVE ENZYMIC CHANGES IN REGENERATING RAT LIVER. *(E.)*

Ebina, Y.; Iwai, H.; Fukui, N.; Ohtsuka, H.; Miura, Y. (Chiba Univ. Sch. Med., Japan). *J. Biochem. (Tokyo)* 77(3):641-645, 1975.

The sequential changes in the activities of ornithine decarboxylase and inosinic acid dehydrogenase in the early period of hepatic regeneration were studied in rats, as was the activation of thymidine kinase and the decrease in cyclic-AMP-phosphodiesterase activity during the later phases of the G_1 period. Male Sprague-Dawley and female Donryu rats were subjected to partial hepatectomy and samples of the regenerating liver were examined for the various enzyme activities and the intracellular cyclic AMP level. The activity or ornithine decarboxylase and inosinic acid dehydrogenase increased soon after partial (70%) hepatectomy, the former continuing to increase for about 10 hr and remaining fairly high for about 32 hr, and the latter reaching a maximum at 8-12 hr. Thymidine kinase activity increased about 24 hr after surgery, with the regeneration process somewhat more rapid in the Sprague-Dawley strain than in the Donryu strain. The intracellular cyclic AMP level showed a biphasic increase at 8 and 24 hr, while the activity of cyclic AMP phosphodiesterase showed no appreciable change during the first 16 hr then rapidly decreased from 16-18 hr. The low level of phosphodiesterase coincided with the period of the second steep rise in the cyclic AMP level. The results suggest that the increase in ornithine decarboxylase activity and the change in the intracellular level of cyclic AMP are important in the regulation of hepatic DNA replication. It is further suggested that inductions of inosinic acid dehydrogenase and thymidine kinase in the late prereplicative period in the regenerating liver is essential for DNA synthesis.

5358 THE KINETIC CHARACTERISTICS OF INHIBITION OF HEPATIC CHOLESTEROGENESIS BY LIPOPROTEINS OF INTESTINAL ORIGIN. *(E.)*

Nervi, F. O.; Weis, H. J.; Dietschy, J. M. (Univ. Texas Health Sci. Cent., Dallas). *J. Biol. Chem.* 250(11):4145-4151, 1975.

The kinetic characteristics of the uptake of cholesterol from intestinal lipoproteins by the rat liver were studied and this phenomenon was correlated with the inhibition of hepatic cholesterogenesis by the lipoproteins. Lipoprotein extracted from donor rats was injected i.v. into female Sprague-Dawley-derived rats as a single bolus or by means of an infusion pump at a rate of 0.2 ml/min; in some cases, rats were instead fed a diet containing 0, 0.1, 0.3, 0.8, or 1.2% cholesterol. The animals were killed after 48 hr, the livers removed and sliced, and the rates of cholesterol and total ketone synthesis determined. Net cholesterol uptake from the circulating intestinal lipoproteins took place only in the liver, and only this tissue manifested inhibition of cholesterol synthesis. Cholesterol uptake by the liver, quantified by a rise in the cholesterol ester content, was a linear function of time and of the amount of lipoprotein cholesterol administered to the animals. In all rats there was a general correlation between inhibition of the rate of cholesterol synthesis and the cholesterol ester content in the liver. However, there was no consistent quantitative relation between these two variables, suggesting either that cholesterol ester was not the immediate effector of the inhibition or, alternatively, that there was an intracellular localization of the effector at the site of control of the rate-limiting enzyme in the cholesterogenic pathway.

5359 ANALYSIS OF REGULATORY FACTORS FOR UREA SYNTHESIS BY ISOLATED PERFUSED RAT LIVER. I. UREA SYNTHESIS WITH AMMONIA AND GLUTAMINE AS NITROGEN SOURCES. *(E.)*

Saheki, T.; Katunuma, N. (Sch. Med., Tokushima Univ., Japan). *J. Biochem. (Tokyo)* 77(3):659-669, 1975.

Urea synthesis in isolated, perfused Wistar rat liver was studied using ammonium chloride and glutamine as nitrogen sources. Samples of the perfusate were taken at 5-20 min intervals and analyzed for urea formation from ammonia and glutamine and for the additional influences of urea cycle intermediates and cofactors. Concentrations of urea, ammonia, and various amino acids were also measured in a sample of liver taken at the end of the experiment. The rate of urea formation increased with ammonium chloride concentration up to 5 mM but remained constant at concentrations of 5-20 mM. The concentration of ammonia in the medium needed to support the half-maximum velocity of urea formation was 0.7 mM. Aspartate (10 mM) and ornithine (2.5 mM) stimulated the rate of urea formation with ammonia. The greater part of the added ornithine was accumulated as citrulline in the liver, indicating that arginosuccinate synthetase was the rate-limiting enzyme of the urea cycle in the perfused liver. N-acetylglutamate also stimulated urea synthesis, but high concentrations (20 mM) were required for the maximum effect. Ornithine and N-acetylglutamate had an additive effect on urea formation. Urea formation from 10 mM glutamine occurred in 3 stages: in the first lag phase, a small amount of glutamine was removed from the medium; in the second stage, the glutamine level decreased rapidly and ammonia was accumulated in the perfusate; and in the third stage the glutamine concentration remained at a constant low level while the accumulated ammonia was rapidly converted into urea. The rate of urea formation in the third stage was much higher than with ammonia as the substrate. Urea formation from glutamine was also stimulated by the addition of ornithine, malate, or N-acetylglutamate to the perfusate. This stimulation was due to an effective conversion of ammonia to urea, the rate of removal of glutamine being unchanged.

5360 TEMPERATURE SENSITIVITY OF BROMOSULPHOPHTHALEIN CLEARANCE BY THE LIVER. *(E.)*

Harris, P. J.; Noble, A. R.; Munday, K. A. (Dep. Physiol. Biochem., Med. Biol. Sci. Build., Southampton, England). *Experientia* 31(4):447-449, 1975.

The effect of temperature on BSP clearance by the isolated, perfused rat liver was studied. Livers from nonfasted male Wistar rats were perfused with a solution containing 10 mg BSP or 20 mM lactate and maintained at 37 C or 27 C. The bile duct was cannulated and the bile flow measured directly, and samples of the perfusate were analyzed at various intervals for BSP and lactate concentration. At 37 C, lactate was taken up from the perfusate at a mean rate of 0.84 μM/min/g, while at 27 C, the rate of lactate consumption was reduced by 45% to 0.46 μM/min/g. The mean rate of bile secretion was also reduced by 47% at 27 C (0.43 μliters/min/g) relative to 37 C (0.82 μliters/min/g). Changes in temperature had no effect on the structure of the liver cells. The initial mean rate of removal of BSP at 37 C was 21.7 μg/min/g, and at 27 C this was reduced to 7.4 μg/min/g; the percentage extraction of BSP at 37 C was 10.0%, while that at 27 C was 5.3%. In addition, while there was a linear disappearance of BSP from the perfusate at 27 C, the removal of BSP at 37 C was greater in the presence of high BSP concentrations than in the presence of low BSP concentrations in the perfusate. The correlation between the perfusate flow rate through the liver, as measured by application of the Fick principle to BSP clearance, and direct collation of the venous outflow was determined. The results indicate that under the conditions described, the mean hepatic blood flow rate can be calculated from BSP clearance at reduced temperatures.

5361 ALCOHOL SELECTION BY DBA AND C57BL MICE ARISING FROM OVA TRANSFERS. *(E.)*

Randall, C. L.; Lester, D. (Sch. Med., Univ. Florida, Gainesville). *Nature* 255(5504):147-148, 1975.

To determine the relative contributions of heredity and environment to alcohol selection by mice, preferences and aversions to alcohol were measured in mice arising from ova transfers between mothers of different strains. Ova donors and recipients were primiparous adult C57BL/6 (alcohol preferrers) and DBA/2 (alcohol avoiders) mice; transfers were made between mice of the same and different strains. The pups were weaned at 25 days and housed individually for 7 days; during this period they were offered a choice between tap water and 7.5% ethanol. The C57BL mice weighed more and drank more alcohol and less water than the DBA mice, and control mice of both strains (not subjected to ova transfer) drank less alcohol and more water than the transferred mice. Thus, the C57BL offspring arising from ova transplanted into DBA mothers not only retained but increased the strain-typical high alcohol preference. The offspring arising from DBA ova transferred to C57BL mothers, on the other hand, also increased their alcohol consumption and did not retain their strain-typical aversion to alcohol. The results support a genetic basis for alcohol selection in the

C57BL mouse, the nature of which remains unknown, while demonstrating that alcohol avoidance in DBA mice is subject to environmental manipulation.

5362 EFFECT OF CHOLERETICS ON BILIARY AND URINARY EXCRETION OF CHOLECYSTOGRAPHIC AGENTS.

(E.) Cooke, W. J.; Mudge, G. H. (Dartmouth Med. Sch., Hanover, N.H.). *Invest. Radiol.* 10(3):189-196, 1975.

The effects of the 2 choleretic agents, taurocholate and cinchophen, on the biliary and urinary excretion of 2 related cholecystographic agents, iopanoic acid and iophenoxic acid, were studied in adult mongrel dogs. The cystic duct was ligated and the common bile duct was cannulated in the anesthetized animals. Sodium iopanoate was infused at a constant rate of 1.6 ml/min in 2% mannitol in isotonic saline; iophenoxic acid was given in an initial dose of 4 mg/kg and sustaining infusions were not used. Sodium taurocholate was infused as a 1.3% solution in isotonic saline at 1.6 ml/min, and cinchophen was given in a priming dose of 50 mg/kg then infused in isotonic saline to provide 40 μg/kg/min. Urine was collected with an indwelling catheter, and liver biopsy samples were obtained during the experiment. The effect of each choleretic agent was specific for its related cholecystographic compound. Taurocholate increased both the biliary and urinary excretion of iopanoic acid and decreased its intrahepatic concentration, but had no effect on iophenoxic acid. Cinchophen had no effect on iopanoic acid but increased both the biliary and urinary excretion of iophenoxic acid. When examined against a preexisting high rate of bile flow, the active choleretic increased, rather than decreased, the biliary concentration of the respective cholecystographic compound. The increased excretion in both the bile and urine cannot be attributed simply to the reduced concentration gradient from plasma to bile, as has been previously suggested. The data are consistent with a direct action of the choleretic agent on hepatic mechanisms, either to decrease intracellular binding or to alter the characteristics of transport.

5363 OCTANOATE METABOLISM IN THE ISOLATED PERFUSED RAT LIVER. II. COMPARISON WITH A LONG CHAIN FATTY ACID.

(E.) Bach, A.; Phan, T.; Metais, P. (Civil Hosp., Strasbourg, France). *Arch. Int. Physiol. Biochim.* 83(1):99-109, 1975.

The effects of octanoic acid and palmitoleic acid on hepatic metabolism were studied in the perfused livers of nonfasted male Wistar rats. The livers were perfused *in vitro* with lactic acid alone (10 mM/liter) or in combination with octanoic acid or palmitoleic acid (1.2 or 2.4 mM/liter). The pH was maintained constant at 7.40 and the neutralized supernatant was assayed at 0, 10, 20, 40, 60, and 80 min for lactate, pyruvate, β-hydroxybutyrate, acetoacetate, and glucose. Lactate alone significantly increased the concentrations of glucose, acetoacetate, and β-hydroxybutyrate at 80 min. When octanoate (1.2 mM/liter) was added to the perfusate, there was a nonsignificant decrease in pyruvate (40 min), a slight but significant increase in glucose (80 min), and a substantial increase in acetoacetate and β-hydroxybutyrate (80 min). When the concentration of octanoate was doubled, a significant decrease in pyruvate (40 min) and a substantial increase in β-hydroxybutyrate (80 min) were observed; the production of glucose and acetoacetate were not further increased. Addition of palmitoleate to the medium caused a significant increase in the pyruvate concentration (80 min) with no increase in glucose production. Octanoic acid was as ketogenic as palmitoleic acid when the 2 fatty acids were compared molecule by molecule, but the former was more ketogenic when the comparison was made on the basis of an equal number of acetyl groups. The results indicate that fatty acids do not play an important role in the rapid control of hepatic gluconeogenesis.

5364 THE RESPONSE OF THE RAT LIVER TO ALTERATIONS IN TOTAL PORTAL BLOOD FLOW.

(E.) Weinbren, K.; Washington, S. L. A.; Smith, C. Y. (R. Postgrad. Med. Sch., London, England). *Br. J. Exp. Pathol.* 56(2):148-156, 1975.

The effects of changes in portal blood flow on the whole rat liver were studied. Male Wistar rats were subjected to a portacaval anastomosis, which left the liver entirely deprived of portal blood flow. After 1 week, the portal flow was reconstructed by ligating and dividing the portacaval anastomosis and re-anastomosing the portal vein to its original stump. The animals were fasted, injected i.p. with thymidine-6-^{3}H, and killed 24-72 hr later. Liver weights were lower in the rats subjected to portacaval anastomosis without reconstitution than in those in which the portal vein was reconstituted. In the animals bearing the anastomosis, there was a significant relative decrease in the weight of the anterior lobes compared with the posterior lobes; of the 2 posterior lobes, the right lobe weighed relatively more in relation to the omental lobe than in the control livers. Cell volumes were much reduced in the rats subjected to portacaval anastomosis, with values generally higher in the animals undergoing portal vein reconstitution than in those still bearing portacaval anastomoses. Specific activity of the liver DNA was also higher in the rats which had undergone reconstitution of the portal vein than in those in which the portacaval anastomosis was retained. Dye injection experiments indicated that the blood flowing through the reformed portal vein in the animals undergoing venous reconstitution reached all 4 liver lobes to a comparable degree. The results suggest that the predominant reaction to portacaval anastomosis was hypertrophy with a minor hyperplastic component. They support the view that the response after partial hepatectomy may represent a summation of reactions to different components of the rather complex stimulus engendered by that procedure.

5365 PLASMA CONCENTRATION OF LIPOPROTEIN-X (LP-X) IN EXPERIMENTAL BILE DUCT OBSTRUCTION.

(E.) Ritland, S.; Bergan, A. (Univ. Hosp., Rikshospitalet, Oslo 1, Norway). *Scand. J. Gastroenterol.* 10(1):17-24, 1975.

Plasma levels of lipoprotein X were studied in bile duct-ligated mongrel dogs (six) with and without cholecystectomy. Dogs were divided into groups: dogs in groups I, IV, and VI had the common bile ducts ligated and cholecystectomy in the same session; dogs in groups II and V had bile duct ligation without cholecystectomy; dogs in group III had the common bile duct dissected free, but without bile duct ligation or cholecystectomy. Sequential quantitative determinations of lipoprotein X, measurements of plasma lipids, the initial rate of cholesterol esterification and liver function tests were performed. The lipoprotein appeared 11 to 21 hr after operation in the bile duct ligated and cholecystectomized dogs, and in dogs with preserved gallbladders 32 hr after operation. The lipoprotein levels were much higher in the cholecystectomized dogs throughout the observation periods (6-41 days) than in those with preserved gallbladders. Lipoprotein X concentration curves in plasma were biphasic in most of the bile duct-obstructed dogs. The first peak after 1-5 days was followed by a fall, and 10-14 days after operation another rise was observed. Fluctuations in the phospholipid and free cholesterol levels occured along with the changes in the lipoprotein. An inverse relation was determined between lipoprotein X and the activity of the lecithin: cholesterol acyltransferase ratio. It is suggested that the changes in plasma lipids during the first days following bile duct obstruction are initiated by abrupt reflux of phospholipids into plasma.

5366 PERSISTENT EFFECTS OF CHENODEOXYCHOLIC ACID ON BILIARY LIPIDS IN THE HAMSTER.

(E.) Goldstein, L. I.; Bonorris, G. G.; Coyne, M. J.; Schoenfield, L. J. (Cedars-Sinai Med. Cent., Los Angeles, Calif.). *J. Lab. Clin. Med.* 85(6): 1032-1041, 1975.

The effects of chenodeoxycholic acid (CDC) ingestion on the biliary lipid composition, the rate-limiting enzymes involved in hepatic cholesterol and bile acid synthesis, and the synthesis of hepatic cholesterol and bile acids were studied in male Syrian golden hamsters to determine the mechanism and duration of the cholesterol desaturation action of CDC. The hamsters were given 20 mg/kg/day of CDC dissolved in 16% ethanol by feeding tube; controls were given the vehicle alone. The animals were killed at the end of the 30-day feeding period or at 10-day intervals thereafter, and the gallbladders and livers were removed for analysis. Administration of CDC for 30 days significantly increased the biliary bile acid and lecithin:cholesterol ratio, as well as the percentage of CDC in the bile. These effects persisted for 20 days after termination of CDC feeding but were not evident after 30 days. The hepatic HMG coenzyme A reductase and 7α-hydroxylase activities were significantly reduced by CDC; these effects persisted for 10, but not 20, days after the end of CDC treatment. CDC had no effect on hepatic cholesterol, although the hepatic CDC concentrations were significantly elevated throughout the experiment. The results suggest that CDC has a salutory effect on the biliary lipid composition while causing an increase in exogenous biliary CDC and a decrease in the endogenous synthesis of cholesterol. The persistence of decreased cholesterol synthesis and of improved biliary lipid composition after discontinuing CDC treatment provides a rationale for studying this effect in man and for testing intermittent CDC regimes for gallstone dissolution.

5367 ETHANOL-INDUCED CROSS TOLERANCE TO SEVERAL HOMOLOGOUS ALCOHOLS IN THE RAT. *(E.)*

LeBlanc, A. E.; Kalant, H. (Addict. Res. Found. Ontario, Toronto, Canada). *Toxicol. Appl. Pharmacol.* 32(1):123-128, 1975.

Ethanol-induced cross tolerances to several lower aliphatic alcohols were studied in male Wistar rats. The animals were trained on the moving belt test which requires them to remain on a motor-driven belt which moves continuously over a shock-grid; if the animal touches the grid it receives a shock. The rats were then given a test dose of ethanol, *n*-propanol, *iso*-propanol, *n*-butanol, or *t*-butanol and tested on the moving belt, after which the ethanol-treated rats and a group of previously untreated rats were started on daily gavage with ethanol (6 mg/kg) for 20 days. At the end of this period, the rats were given test doses of ethanol and the other 4 alcohols and once again tested on the moving belt. The blood alcohol concentrations produced by the various doses of each alcohol were not significantly different in the pre- and postethanol groups; there was a linear correlation between dose and blood concentration in each case. This relation was not altered by chronic ethanol treatment. When the doses were corrected by the respective thermodynamic activity coefficients of the various alcohols, almost identical dose-response curves were obtained prior to chronic ethanol treatment. After chronic ethanol administration, the rats showed complete cross-tolerance to ethanol and the other alcohols; all of the corrected dose-response curves shifted to the same degree. This was not due to metabolic or distribution factors, which indicates that the findings reflect cross-tolerance in the nervous system itself. Thus, the effects of the various alcohols *in vivo* appear to depend on their common actions rather than on their unique actions, and involve complex integrative functions rather than the most basic membrane properties.

5368 ELECTRON MICROSCOPIC CYTOCHEMICAL CHARACTERIZATION OF BILE CANALICULI AND BILE DUCTS IN VITRO.

(E.) Oda, M.; Phillips, M. J. (Toronto Gen. Hosp., Canada). *Virchows Arch. [Zellpathol.]* 18(2):109-118, 1975.

Subcellular fractions from liver homogenates were used for cytochemical analysis of Mg^{++} ATPase and 5'-nucleotidase (AMPase). Liver tissue from Wistar rats was homogenized and the bile canaliculus-rich, and bile duct fractions isolated. Lead nitrate (200 mM) was used as the capture agent and 2 mM ATP or 5'-AMP as the substrate. After incubation, the suspension was centrifuged, fixed in glutaraldehyde, incubated, and postfixed in osmium tetroxide. Freshly prepared bile canaliculus or bile duct containing fractions were also prefixed in glutaraldehyde, recentrifuged, and postfixed in osmium tetroxide. Control fractions, prefixed or non-prefixed, were incubated without lead nitrate or substrate. Isolated bile canaliculi came through structurally intact, as did the bile ducts. The latter were usually surrounded by a basement membrane and partially disrupted hepatocytes. None of the controls showed electron-dense reaction products. Both prefixed and non-prefixed canaliculi showed Mg^{++} ATPase activity predominantly on the microvilli, though fine structural preservation was better in the prefixed specimens. Activity was also found on the canalicular microvilli of the partially disrupted hepatocytes, but not on the bile duct microvilli. The reaction products appeared to be deposited on the outer luminal surfaces of the canalicular membranes in the prefixed specimens. The non-prefixed canaliculi showed intense AMPase activity on the microvilli, and less intense activity on the lateral hepatic plasma membranes. There was a light reaction on vesicles presumably derived from fragmented plasma membranes. Demonstrable AMPase activity was dependent on duration of fixation. AMPase activity in the prefixed preparations was located primarily on the outer microvillar surfaces, and to a much lesser extent on the lateral plasma membranes and vesicles. No activity was seen on the microvilli or lateral or basal membranes of the bile ducts. No intracytoplasmic organelles showed activity of either AMPase or Mg^{++} ATPase. It is concluded that study of subcellular fractions is advantageous over study of whole liver tissue, and that the bile canalicular membrane is specialized for secretion of bile constituents from the cells into the canalicular lumens.

5369 THE EFFECTS OF ACUTE CADMIUM ADMINISTRATION IN THE LIVER AND KIDNEY OF THE RAT: LIGHT AND ELECTRON MICROSCOPIC STUDIES.

(E.) Hoffmann, E. O.; Cook, J. A.; Di Luzio, N. R.; Coover, J. A. (Louisiana State Univ. Sch. Med., New Orleans). *Lab. Invest.* 32(5):655-664, 1975.

Rat liver and kidney cells were studied by light and electron microscopy after injection of cadmium acetate. Charles River rats were injected i.v. with 0.600 mg cadmium acetate/100 g 5% dextrose, *via* the dorsal vein of the penis. Controls were given dextrose solution only. For light microscopy, rats were killed at 4, 8, and 16 hr. Liver and kidney slices were fixed and stained in hematoxylin and eosin (6 μm sections) or Paragon multiple stain (1 μm sections). For electron microscopy, rats were killed at 8 hr, and fragments of liver only were fixed in paraformaldehyde-*s*-collidine buffer, postfixed in osmium tetroxide, and stained with uranyl acetate and lead citrate. Mortality was 0% at 4 hr, and 5% at 16 hr. Light microscopy showed insignificant changes in the kidneys. The liver appeared normal after 4 hr, but by 8 hr early lesions occurred in 50% of the rats, and at 16 hr, 90-95% showed scattered single parenchymal necrosis, congestion, and mild Kupffer cell vacuolation. There was a mild inflammatory cell infiltrate. Some rats dying before 16 hr showed necrosis, apparently in the mid-lobular zone. Electron microscope examination of Kupffer cells showed vacuoles, increase in dilated smooth endoplasmic reticulum, swelling of mitochondria, and cytoplasmic degradation. Desquamation was evident and polyribosomes were more prominent than in controls. Deposits of fibrin, platelets, cellular debris, inflammatory cells, and precipitated protein were found in the sinusoidal and Disse's spaces. Electron dense collagen fibers were observed in these areas. Scattered individual hepatocytes showed necrosis and areas of cytoplasmic degeneration. Many showed an increase in cytoplasmic vacuoles attributable to phagosomes, proliferation and dilation of smooth endoplasmic reticulum, pinocytotic vacuoles usually located toward the sinusoids and Disse's spaces, and lipid droplets. There was also detachment of ribosomes, fragmentation of membranes, and dilation of rough endoplasmic reticulum. Some cells showed more polyribosomes and loose ribosomes than controls, and occasional mitochondria were impregnated and swollen. Glycogen was consistently absent from hepatocytic cytoplasm. It is concluded that the lesions are similar to those produced by certain other non-metallic hepatotoxins.

5370 ANIMAL MODEL: CHOLELITHIASIS IN BRAZILIAN SQUIRREL MONKEYS (Saimiri sciureus).

(E.) Lofland, H. B. (Bowman Gray Sch. Med., Winston-Salem, N.C.). *Am. J. Pathol.* 79(3):619-622, 1975.

Dietary factors in cholelithiasis were studied in the Brazilian squirrel monkey. Monkeys fed diets containing cholesterol and polyunsaturated fats for a period of nine months had almost 100% incidence of cholelithiasis. In monkeys fed cholesterol and safflower oil, 8/9 developed stones; in animals fed butter, 3/7 were affected; in those fed coconut oil, 1/7 was affected. Isotopic studies showed that the butter-fed animals had the largest bile acid pool size, and slowest turnover rate, while those fed safflower oil had the fastest turnover and the smallest pool size. Those fed coconut oil had a small pool size not differing significantly from the safflower oil-fed monkeys. The exacerbation of the disease by polyunsaturates in the monkeys resembles that in man. It is concluded that frequency of stone formation in the squirrel monkey is inversely related to the plasma cholesterol concentration, and provides a suitable model for the disease in man.

5371 BILIARY LIPIDS DURING VITAMIN C FEEDING IN HEALTHY PERSONS.

(E.) Pederson, L. (Aalborg Hosp. North, Denmark). *Scand. J. Gastroenterol.* 10(3):311-314, 1975.

The influence of vitamin C on biliary lipids was studied in 10 healthy patients. None had taken vitamin C apart from dietary sources for at least one yr. Fasting duodenal bile samples were obtained by duodenal intubation after cholecystokinin stimulation. Plasma samples were obtained simultaneously. During the following 10-15 days, each subject took 1 g vitamin C daily in divided doses; then fresh bile and plasma samples were obtained. Total bile acids, cholesterol and biliary phospholipids were determined. Percent concentrations of individual lipids in relation to total biliary lipids, the molar ratio between cholesterol and bile acids and the molar ratio between cholesterol and bile acids plus phospholipids were calculated. Differences between all values before and after treatment with vitamin C were statistically insignificant. It is concluded that vitamin C probably has no influence on biliary lipid composition in healthy humans.

5372 PROTEIN SYNTHESIS IN MITOCHONDRIA AND MICROSOMAL FRACTIONS FROM RAT BRAIN AND LIVER AFTER ACUTE OR CHRONIC ETHANOL ADMINISTRATION.

(E.) Renis, M.; Giovine, A.; Bertolino, A. (Psychiatric Hosp., Casa Divina Provvidenza, Bisceglie (Bari), Italy). *Life Sci.* 16(9):1447-1458, 1975.

The effects of ethanol on the protein synthesizing capacity of the brain was studied in young male Wistar rats. Ethanol was administered to the rats for 20-25 days in the drinking water (20% ethanol) or was administered p.o. by stomach tube (5 g/kg) 3 hr before sacrifice. Incorporation of ^{14}C- or ^{3}H-leucine into brain and liver microsomes and mitochondria was determined *in vivo* and *in vitro*. For the study of protein synthesis *in vivo*, rats were sacrificed 1/2 hr after i.p. injection of ^{3}H-leucine. Protein synthesis in the mitochondrial preparations was significantly inhibited by chloramphenicol and practically unaffected by cycloheximide; the latter, however, specifically inhibited the microsomal preparations. Chronic ethanol administration increased *in vitro* protein synthesis in liver microsomes and mitochondria, while acute ethanol treatment inhibited it. Ethanol administration had no significant effects on protein synthesis in brain mitochondria, although chronic treatment had an inhibitory effect on brain microsomal preparations. The ethanol effect on liver microsomes was noticeably extended at the ribosomal level, as indicated by measurements of ^{3}H-leucine incorporation in isolated microsomes crossed with pH 5 enzymes from rat liver and brain after chronic ethanol treatment. Acute ethanol treatment decreased the *in vivo* incorporation of radioactive leucine into liver mitochondria and brain and liver microsomes, with no significant effects on brain mitochondria. Chronic administration had no significant effects on *in vivo* protein synthesis. These results indicate that ethanol affects protein synthesis *in vitro* only after chronic administration; the effects are opposite in the brain and liver but similar in the microsomal and mitochondrial fractions of each organ.

5373 ISOLATION OF CENTROLOBULAR AND PERILOBULAR HEPATOCYTES AFTER PHENOBARBITAL TREATMENT.

(E.) Wanson, J. C.; Drochmans, P.; May, C.; Penasse, W.; Popowski, A. (Lab. Cytol. Exp. Oncol., Free Univ., Brussels, Belgium). *J. Cell Biol.* 66(11):23-41, 1975.

I.p. phenobarbital injections (100 mg/kg/day for 3-7 days) were used to induce a clear selective response in the centrolobular hepatocytes of adult female Sprague-Dawley rats. Following phenobarbital treatment, the hepatocytes were examined by electron microscopy, and their protein, DNA, RNA, and glycogen concentrations and glucose-6-phosphatase activities determined. The phenobarbital injections induced an intense proliferation of the smooth endoplasmic reticulum (ER) associated with a decrease in the activity of glucose-6-phosphatase. The centrolobular hepatocytes were the first affected, leading to an enhancement of liver lobule heterogeneity. Two liver cell populations were distinguished following subfractionation of the hepatocytes on Ficoll density gradients: light hepatocytes (mean density 1.10), which had the same morphological characteristics as the centrolobular cells, i.e., an abundant smooth ER composed of tubular elements, numerous small mitochondria, and few glycogen particles; and heavy hepatocytes (mean density 1.14), which were characterized by large and compact glycogen areas and prominent rough endoplasmic cisternae, as are the perilobular cells. After incubation in Wachstein-Meisel medium, the centrolobular hepatocytes exhibited dispersed reaction sites of glucose-6-phosphatase activity, whereas the periolobular cells showed a continuous and intense reaction pattern. Morphometric determinations showed the centrolobular phenobarbital hepatocytes to be considerably enlarged (mean diameter: 23.7 μm); the perilobular hepatocytes had a significantly smaller mean diameter of 19.2 μm, which is close to the values of control liver cells.

5374 COLCHICINE INHIBITION OF PLASMA PROTEIN RELEASE FROM RAT HEPATOCYTES.

(E.) Redman, C. M.; Banerjee, D.; Howell, K.; Palade, G. E. (New York Blood Cent., N.Y.). *J. Cell Biol.* 66(1): 42-59, 1975.

The effects of colchicine and functionally related agents on the *in vitro* and *in vivo* secretion of albumin and other plasma proteins by the rat liver were studied. Ethanol (0.6 g/100 g of a 50% solution) was given p.o. by stomach tube to fasted male rats, after which colchicine or radioactive amino acid was administered i.v. *In vitro*, rat liver slices were incubated with radioactive leucine, washed, and transferred to a "chase" medium containing nonradioactive amino acids and colchicine or vinblastine. Radioactivity in the albumin and other plasma proteins was determined by immunoprecipitation, and liver samples from the rats treated *in vivo* were examined by electron microscopy. Colchicine inhibited the secretion of albumin and other plasma proteins both *in vitro* and *in vivo*. *In vitro* secretion of these proteins by the rat liver slices was inhibited by doses as low as 10^{-6} M, the maximal effect occurring at 10^{-5} M. Inhibition of secretion was accompanied by a concomitant retention of nonsecreted proteins within the slices. Colchicine did not inhibit protein synthesis at these concentrations. Vinblastine also inhibited plasma protein secretion, while lumicolchicine, griseofulvin, and cytochalasin B had no such effect. The inhibition of secretion by colchicine and vinblastine was not due to changes in the intracellular nucleotide phosphate levels. When administered i.v. at 10-25 μM/100 g, colchicine acted within 2 min and its inhibitory effect lasted for at least 3 hr. This agent had no effect on the transport of secretory proteins in the rough or smooth endoplasmic reticulum, but it caused these proteins to accumulate in the Golgi-derived secretory vesicles. Neither the concentration nor the arrangement of microtubules within the Golgi regions appeared to be affected by colchicine at the concentrations used. The results indicate that colchicine acts by hampering the discharge of secretory proteins from Golgi-derived secretory vacuoles into the space of Disse.

5375 ISOLATION AND SUBFRACTIONATION ON FICOLL GRADIENTS OF ADULT RAT HEPATOCYTES: SIZE, MORPHOLOGY, AND BIOCHEMICAL CHARACTERISTICS OF CELL FRACTIONS. *(E.)* Drochmans, P.; Wanson, J. C.; Mosselmans, R. (Lab. Cytol. Exp. Oncol., Free Univ., Brussels, Belgium). *J. Cell Biol.* 66(1):1-22, 1975.

A technique for the isolation and subfractionation of adult rat hepatocytes is described. The recirculating perfusion of rat liver with a Ca^{++}-free Hank's solution produced a release of the adhesiveness of the cells and a cleaving of the desmosomes. The subsequent addition of collagenase and hyaluronidase to the perfusion medium led to a complete dissociation of the liver tissue into a mixture of isolated cells and cell cords in which the hepatocytes remained connected with specific junctional differentiations, namely the gap and tight junctions. Individual cells were released by submitting the suspension of cell trabeculae to a gentle rolling. The gap junctions were thereby ruptured, generally remaining attached to one cell and taking with them a small portion of cytoplasm. In this manner, 60-65% of the liver parenchymal cells were isolated; endothelial cells and other cells of the connective tissue were not recovered. The ultrastructural preservation of the isolated hepatocytes was excellent and the glucose-6-phosphatase activity appeared unaltered in most cases. Protein, DNA, and RNA recovery in the preparations was also satisfactory, amounting to 70% of that found in liver homogenate; glycogen was partly lost or degraded during the manipulations. Measurements of cell diameter confirmed the preservation of the original volume of the *in situ* hepatocytes and the presence of more than 1 type of parenchymal cell. By submitting this heterogeneous cell population to an isopycnic density gradient centrifugation, 2 types of hepatocytes were distinguished: the light hepatocytes, with a mean diameter of 20.5 μm and a mean density of 1.10, were characterized by an extended smooth endoplasmic reticulum entrapping dispersed α-glycogen particles; the heavy hepatocytes, with a mean diameter of 19.0 μm and a mean density of 1.14, presented a relatively reduced compartment of smooth endoplasmic reticulum and large accumulations of glycogen. It is suggested that the low-density cell fraction corresponds to centrolobular cells and the high-density fraction to periolobular hepatocytes.

5376 IMPAIRED HEPATIC RELEASE OF TRIGLYCERIDES: A POSSIBLE CAUSE OF ACUTE ALCOHOLIC FATTY LIVER IN THE RHESUS MONKEY. *(E.)* Nair, C. R.; Nirankari, O. P.; Chhuttani, P. N.; Datta, D. V. (Postgrad. Inst. Med. Educ. Res., Chandigarh, India). *Clin. Sci. Mol. Med.* 48(5):453-455, 1975.

The effects of Triton WR-1339 on the plasma triglycerides of ethanol-treated Rhesus monkeys were studied to determine the mechanism involved in the development of acute alcoholic fatty liver. Well-nourished Rhesus monkeys with no histological evidence of liver disease received an infusion of sodium chloride for 30 min followed by an i.v. infusion of Triton WR-1339 (20% solution at a rate of 26.6 mg/min/kg for 10 min). In some animals, the Triton WR-1339 infusion was preceded by a 30-min i.v. infusion of ethanol (214 mM/liter in saline at a rate of 1.8 mM/min/kg). Blood samples were collected 0, 2, 4, and 6 hr after the end of the Triton infusion, and the plasma triglycerides, plasma Triton, and blood ethanol levels were estimated. Liver biopsy tissue was also examined histologically and the liver triglycerides measured. In addition, the inhibitory effect of Triton on plasma lipoprotein lipase was studied *in vitro*. In the saline-Triton group, the plasma triglycerides rose 10- to 19-fold over basal values by the sixth hr; the liver triglyceride levels remained normal. In contrast, the ethanol-Triton group showed only a 1.2- to 2.3-fold rise in plasma triglycerides, with a significant rise in the liver triglycerides. Ethanol had no significant effect on the plasma Triton concentration, and inhibition of lipolysis was 94% in the saline-Triton group compared with 93.5% in the ethanol-Triton group. It is suggested that the reductive effect of Triton on the plasma triglycerides following ethanol administration is due to a reduced release of triglyceride from the liver. Acute alcoholic fatty liver in Rhesus monkeys is probably due to impairment in the hepatic release of triglycerides.

5377 EFFECT OF CHRONIC INTAKE OF ETHANOL ON LACTATE/PYRUVATE AND β-HYDROXYBUTYRATE/ACETOACETATE RATIOS IN RAT LIVER. *(E.)* Khanna, J. M.; Kalant, H.; Loth, J. (Dep. Pharmacol., Univ. Toronto, Canada). *Can. J. Physiol. Pharmacol.* 53(2):299-303, 1975.

Lactate/pyruvate and β-hydroxybutyrate/acetoacetate ratios were measured in male Wistar rats chronically treated with ethanol. The experimental rats were fed a liquid diet providing 35% of the calories as ethanol, while pair-fed controls received a similar diet in which the alcohol was replaced by an equicaloric concentration of sucrose. The ethanol diet was discontinued immediately, 24 hr, or 48 hr before sacrifice (1 month after the beginning of the experiment). In some animals in which the ethanol feeding was terminated 48 hr prior to sacrifice, and in their controls, ethanol (1 g/kg) was injected i.p. 1 or 3 hr before sacrifice. The lactate/pyruvate ratio was significantly higher in the ethanol-fed rats than in the controls when the ethanol diet was continued until sacrifice, but the two groups did not differ in this respect when the ethanol diet was discontinued prior to sacrifice. The β-hydroxybutyrate/

acetoacetate ratio was also significantly higher in the ethanol group when the ethanol diet was continued until the time of sacrifice; again, however, this difference disappeared when the ethanol feeding was discontinued 24 or 48 hr prior to sacrifice. In contrast, when ethanol was injected 1-3 hr before sacrifice, the β-hydroxybutyrate/acetoacetate ratio was significantly higher in the controls. The results are compatible with an adaptive increase in the mitochondrial reoxidation of NADH in the chronic alcohol groups, but the possibility of a change due to alcohol withdrawal cannot be excluded.

5378 ON THE QUANTITATIVE STEREO-MORPHOLOGY OF MICROBODIES IN RAT HEPATOCYTES. *(E.)* Wedel, F. P.; Berger, E. R. (VA Hosp., Brooklyn, N.Y.). *J. Ultrastruct. Res.* 51(2):153-165, 1975.

Microbodies in rat hepatocytes were studied quantitatively, stereologically, morphometrically, and ultrastructurally. Employing the modified Sjostrand technique for 3-dimensional reconstructions from serial thin sections for electron microscopy, two populations of particles were revealed. The larger class P microbodies were spherical particles, about 410 nm in diameter, and bounded by a limiting membrane about 110 Å thick; they contained a finely granular matrix with a dense nucleoid and constituted approximately 1.1% of the hepatic cytoplasm. The smaller class Q particles were also spherical and about 260 nm in diameter. They contained a granular matrix but lacked a nucleoid and their limiting membrane was trilaminar and about 130 Å in thickness. These particles constituted about 0.1-0.2% of the hepatic cytoplasm. While it is likely that the class P microbodies are peroxisomal, there is no morphological evidence to suggest that the class Q particles are small or immature peroxisomes. It is possible that the class Q microbodies are lysosomal or that they are a distinct population of hepatic cytoplasmic organelles which have not previously been described.

5379 EFFECT OF MODIFICATION OF THYROID FUNCTION ON CHOLESTEROL 7α-HYDROXYLATION IN RAT LIVER. *(E.)* Takeuchi, N.; Ito, M.; Uchida, K.; Yamamura, Y. (Osaka Univ. Hosp., Japan). *Biochem. J.* 148(3):499-503, 1975.

The effect of p.o. glucose or cholesterol administration on hepatic cholesterol synthesis and cholesterol 7α-hydroxylation was studied in hyper- and hypothyroid rats. Female Sprague-Dawley rats were fed desiccated thyroid powder (6, 18, or 54 mg/day for 10 days) to make them hyperthyroid or were fed 2-thiouracil (75 or 100 mg/day for 10 days) to make them hypothyroid. The rats were then starved and given 2 ml of 50% glucose solution/100 g and killed 3 hr later, or were given a cholesterol suspension in peanut oil (2 ml/100 g of 1.3 g cholesterol and 0.3 g cholic acid in 40 ml peanut oil) daily for 3 days. The thyroid powder and thiouracil treatments were continued during cholesterol administration. Glucose-induced increases in cholesterol synthesis and 7α-hydroxylation were enhanced by pretreatment with thyroid powder and suppressed by pretreatment with thiouracil. The enhancement of 7α-hydroxylation was produced by a relatively small amount of thyroid powder (6-18 mg), while high doses were required to increase cholesterol synthesis. In contrast, 7α-hydroxylation was suppressed by 50-75 mg thiouracil, much higher doses being required to decrease cholesterol synthesis. Although cholesterol synthesis was increased to a similar degree in both hypo- and hyperthyroid rats after glucose administration, hydroxylase activity in the hypothyroid rats increased more slowly and attained a lower maximum level than in the hyperthyroid rats. It is concluded that cholesterol 7α-hydroxylase activity is more sensitive to thyroid function than are the activities of cholesterol-synthetic enzymes. When exogeneous cholesterol was given, the hypothyroid rats showed a larger increase in the serum cholesterol concentration than the hyperthyroid rats, and there was an inverse relation between the serum cholesterol concentrations and hepatic cholesterol 7α-hydroxylase activities.

5380 MORPHOLOGICAL ALTERATION THROUGH CHANGES IN RESPIRATORY ENZYME LEVELS IN THE LIVER MITOCHONDRIA OF JAUNDICED PATIENTS. *(E.)* Takasan, H.; Yamada, T.; Ozawa, K.; Honjo, I. (Kyoto Univ. Sch. Med., Japan). *J. Electron Microsc. (Tokyo)* 24(1):19-32, 1975.

Morphological and biochemical alterations in the liver mitochondria of 20 patients with obstructive jaundice were studied. Sectioned biopsy specimens were examined by electron microscopy and mitochondrial preparations were examined in terms of phosphorylative efficiency and oxygen utilization; the respiratory enzymes of the liver mitochondria were also assayed using spectrophotometric techniques. The patients were classified into 3 groups according to the concentrations of cytochrome a(+a_3) in their liver mitochondria: in group I, the cytochrome a(+a_3) concentration was 0.5-1.0 x 10^{-10} M/mg mitochondrial protein; in group II, the concentration was over 1.0 x 10^{-10} M/mg; and in group III, the concentration was less than 0.5 x 10^{-10} M/mg. In 6 of the 9 group I patients, the absolute phosphorylative activities of the liver mitochondria were substantially above control values and the phosphorylative activities/U of cytochrome a(+a_3) were enhanced. In 6 of the 8 group II patients, the absolute phosphorylative activities were slightly reduced below control levels and the phosphorylative activities/U of cytochrome a(+a_3) were inhibited. In 4 patients in group III, both the absolute phosphorylative activities and the phosphorylative activities/U of cytochrome a(+a_3) were severely inhibited. Morphologically, the mitochondria in group I were round or oval in shape with an electron-lucent matrix. In group II the mitochondria were enlarged and there were increased numbers of cristae; giant- or mega-mitochondria were frequently observed. In group III, the mitochondrial cristae were decreased in number and showed an irregular arrangement; the matrix was also decreased in density with a loss of intramitochondrial granules and swelling. The various morphological changes seen in the liver mitochondria of groups I and II, including the appearance of partition- and mega-mitochondria, appeared to represent a series of adaptive phenomena for maintaining intracellular energy metabolism in obstructive jaundice.

5381 THE EFFECT OF PROSTAGLANDIN A_1 AND E_1 ON CANINE HEPATIC BILE FLOW.

(E.) Kaminski, D. L.; Ruwart, M.; Willman, V. L. (St. Louis Univ. Sch. Med., Mo.). *J. Surg. Res.* 18(4):391-397, 1975.

The effects of prostaglandins A_1 and E_1 on the excretion of bile salt, secretin, and cholecystokinin-stimulated hepatic bile flow were studied in dogs with chronic biliary and gastric fistulas. The dogs received a continuous i.v. infusion of 0.15 M NaCl solution or of a sodium taurocholate solution (18 μM/min). In some cases, secretin (2 U/kg/hr) or CCK-octapeptide (4 μg/kg/hr) was infused with the bile salt. The prostaglandins (2.5 μg/kg/min) were given simultaneously through separate i.v. lines. The bile and gastric secretions were collected and measured throughout the infusion periods. PGA_1 infusion caused an increase in bile volume and in both bicarbonate concentration and output; bile salt concentration was decreased and sodium and chloride output increased. Similar effects were obtained with PGE_1 infusion, although the change in bile volume was not significant. PGA_1 administered during secretin-stimulated bile flow resulted in a significant inhibition of bile flow and sodium output and a significant increase in the bicarbonate and bile salt concentrations. PGE_1 significantly increased the bile salt output and concentration under these conditions but did not affect the volume or electrolyte composition of the bile. PGE_1 inhibited the CCK-octapeptide-stimulated gastric fistular hydrogen ion output by 54.6% and significantly decreased the bile salt concentration. PGA_1 inhibited the CCK-octapeptide-stimulated gastric acid response by 40.2% and increased the sodium output and concentration but had no significant effect on bile volume. At no time did the pH of the duodenal fluid fall below 5.0. The data indicate that PGE_1 and PGA_1 are potent inhibitors of gastric acid secretion and that they are effective inhibitors of CCK-octapeptide-stimulated hydrogen ion output and pentagastrin-stimulated hydrogen ion output.

5382 EFFECT OF EXOGENOUS CYTOCHROME C ON OXIDATIVE PHOSPHORYLATION IN RAT LIVER IN ACUTE TOXIC HEPATITIS.

(Rus.) Slepneva, L. B.; Krivoruchko, B. I. (Res. Inst. Hematol. Blood Transf., Leningrad, USSR). *Biull. Eksp. Biol. Med.* 77(6):46-48, 1974.

The effect of parenteral administration of cytochrome C on processes of oxidative phosphorylation in the liver of rats with acute toxic hepatitis, caused by a single subcutaneous injection of CCl_4, was studied. Experimental rats (160-220 g) were divided into 3 groups. Into the rats of the first group a 0.25 ml/100 g dose of 40% peach oil solution of CCl_4 was injected and the animals were killed 1, 3, or 7 days after the injection. Rats of the second group received daily injections of 10 mg/1 kg of cytochrome C beginning from the day of the CCl_4 injection. Instead of CCl_4 and cytochrome C, the third (control) group of rats were injected with equivalent volumes of peach oil and physiological solution. Results indicated that parenteral introduction of cytochrome C during acute intoxication by CCl_4 leads to an increase in intensity of the processes of respiration and phosphorylation in homogenates of rat liver and to the increase in intensity of conjugation of these processes. It is concluded that stimulation of oxidative phosphorylation processes in tissue of rat liver during acute intoxication with CCl_4 and during introduction of cytochrome C might be connected with the penetration of cytochrome C into the cell and its direct effect on intracellular structure of the liver.

5383 EFFECT OF EXCESSIVE INGESTION OF DIFFERENT KINDS OF FATS ON LIPID COMPOSITION AND THE USE OF EXOGENOUS FATTY ACIDS IN LIPID SYNTHESIS.

(Rus.) Markelova, V. F.; Liapkov, B. G. (Inst. Nutr. USSR Acad. Med. Sci., Moscow). *Vopr. Pitan.* (4):8-11, 1974.

The objective of the study was to elucidate the effect of prolonged feeding of rats with excessive quantities of various fats on the composition of lipids of liver and blood, and to determine under experimental conditions the degree of involvement of fatty acids in synthesis of glycerides, phospholipids, cholesterol and its ethers. The experimental male rats (140-160 g) were fed for 30 days with isocaloric rations of 60 kcal/100 g of wt. The typical ration of the control group rats consisted calorie-wise of 18% proteins, 56% carbohydrates, and 26% of lard or sunflower oil. During the course of experimentation, in order to retain isocaloric conditions, a fraction of fat in the rations of experimental rats was increased at the expense of carbohydrates. The results showed that prolonged feeding of rats with rations with excessive fat content led to the increase of lipids, glycerides and of ethers of cholesterol in the liver; it also led to intensification of synthesis of these compounds, which in turn led to a deficit of phospholipids, favoring the formation of lipodystrophy of liver.

5384 THE EFFECT OF HEPATIC ISCHEMIA ON LIVER FUNCTION AND THE RESTORATION OF LIVER MASS AFTER 70 PER CENT PARTIAL HEPATECTOMY IN THE DOG.

(E.) Mackenzie, R. J.; Furnival, C. M.; O'Keane, M. A.; Blumgart, L. H. (Wellcome Surg. Res. Inst., Univ. Glasgow, Scotland). *Br. J. Surg.* 62(6):431-437, 1975.

The effect of normothermic ischemia of the liver prior to resection was studied in relation to postoperative liver function and restoration of liver mass. Dogs (39) had partial hepatectomies to remove 70% of the liver including the left and central portions. In 17, the branches of the portal vein and hepatic artery supplying the caudate and right lateral lobes were occluded for 30, 45, or 60 min. At the end of each period after restoration of blood flow, portal hepatectomy was performed. In 17 dogs, partial hepatectomy only was performed, and in 5 controls, laparotomy (with handling of the viscera) only was performed. Serum bilirubin, alkaline phosphatase, SGPT, SGOT, total protein, albumin, and BSP retention were measured daily for 1 week postoperatively, and then weekly for 6 weeks. Of the 17 given partial hepatectomy only, 2 died from technical failure, 1 from unknown causes, and 3 developed obstructive jaundice. In the remaining 11, determinations were made. Alkaline phosphatase rose significantly to a peak of 290 U/liter at 1 week. Both SGOT and SGPT showed a large increase within 48 hr (300 mu/ml and 220 mu/ml, resp.) Total serum protein paralleled serum albumin, falling to its lowest value (35 g/liter) one week postoperatively. BSP retention was measured in eight dogs and showed an abnormal rise to 25% on the second postoperative day, followed by a return to normal. Liver restoration was 91% at the time of sacrifice and regenerated tissue was histologically normal. Of the 17 given ischemia plus partial hepatectomy, 15 survived. Serum alkaline phosphatase activity was elevated immediately after operation (130 U/liter), and in some dogs it continued to rise (360 U/liter by six weeks). SGOT and SGPT rose to peaks 48 hr after surgery (190 mu/ml, and 250 mu/ml, resp.). Serum total protein fell due to a fall in serum albumin, which reached its lowest value (29 g/liter) 3 days after surgery. BSP retention increased 24% on the 2nd day. Of the dogs, 7 also showed a late rise to 12-42% retention at various times between the 3rd and 6th weeks. Liver restoration was 83%. In the controls, SGOT rose to 99 mu/ml on the first day. Serum albumin fell, reaching a minimum value (34 g/liter) after 1 week. It is concluded that ischemia of the liver remnant for 1 hr before resection is compatible with survival in the dog.

5385 EARLY, REVERSIBLE PLASMA MEMBRANE INJURY IN GALACTOSAMINE-INDUCED LIVER CELL DEATH. *(E.)* El-Mofty, S. K.; Scrutton, M. C.; Serroni, A.; Nicolini, C.; Farber, J. (Temple Univ. Sch. Med., Philadelphia, Pa.). *Am. J. Pathol.* 79(3):579-596, 1975.

The role of plasma membranes in the pathogenesis of galactosamine-induced cell death was studied in the rat. Wistar rats injected i.p. with D-galactosamine (200 or 400 mg/kg), uridine (1.2 mg/g), glucosamine (400 mg/kg), or D,L-ethionine (1 mg/g). The rats were killed, the plasma membranes isolated from the livers, and 5'-nucleotidase, protein, glucose-6-phosphate, and cytochrome C oxidase determined. Membrane proteins were electrophoresed on polyacrylamide gels, and circular dichroism measurements were made of suspensions by spectropolarimeter. Liver samples were analyzed for calcium and copper content. Rates of *in vitro* nuclear RNA and protein synthesis were determined. The higher dose of galactosamine caused a 40% reduction in specific activity of 5'-nucleotidase in plasma membranes and markedly altered the circular dichroism of the membranes, as indicated by a 2-fold increase in maximum negative ellipticity at 22 nm (from -5680 to -9050). These effects were not seen in rats given the lower dose of galactosamine. Neither glucosamine nor ethionine caused cell death; 5'-nucleotidase activity was not inhibited in glucosamine-treated rats. Uridine administered simultaneously with galactosamine prevented the alterations in both 5'-nucleotidase and circular dichroism. Administration of uridine 2-2 1/2 hr after galactosamine reversed the inhibition of 5'-nucleotidase and significantly reduced the maximum negative ellipticity. Uridine could not reverse the membrane alterations after 3 hr, but it did reverse the inhibition of RNA and protein synthesis 6 hr after injection of 400 mg/kg galactosamine. Liver calcium levels rose from 2 hr following either 200 or 400 mg/kg galactosamine. With the higher dose, the calcium content remained constant at 3-4 hr and then rose sharply to a peak of 4 times the initial values at 12 hr. At 12-24 hr the level declined to twice the initial value. With the lower dose, the calcium level declined at 3-4 hr and then rose slightly to a peak value of less than twice the initial level by 12 hr. Copper content was not affected by galactosamine. Ethionine and glucosamine did not induce a rise in calcium content. It is concluded that necrogenic doses of galactosamine produce early changes in rat liver plasma membranes and in total cell calcium ions.

5386 TOXICITY OF CHENODEOXYCHOLIC ACID IN THE NONHUMAN PRIMATE. *(E.)* Morrissey, K. P.; McSherry, C. K.; Swarm, R. L.; Nieman, W. H.; Deitrick, J. E. (New York Hosp.-Cornell Med. Cent., New York, N.Y.). *Surgery* 77(6):851-860, 1975.

The toxicity of chenodeoxycholic acid was studied in the baboon. Pregnant and nonpregnant female baboons (*Papio anubis* and *P. cyanocephalus*) had the gallbladder sutured to the anterior abdominal wall during exploratory laparotomy, and were assigned to control (8) or chenodeoxycholic acid-treated groups (10). The treated group was given 18 mg/kg/day chenodeoxycholic acid in 0.5 cc ethanol in an orange, while controls were given oranges with ethanol only. Over a 6-month period the treated group was divided into a low-dose group of 2 baboons given 20 mg/kg/day for 14 months; an incremental-dose group of 10 which were progressed by 2 mg/week from 18 to 38 mg/kg/day over 2 1/2 months in a total experimental period of 15 months; and a high-dose group of 6 given 38 mg/kg/day for 8 months. Animals were observed daily for well-being, behavior, menstruation, food consumption, and character of food droppings or excreta. Weight and clinical chemistry were determined monthly. Percutaneous liver biopsies and gallbladder bile aspirates were obtained periodically. Bile pool salt size was determined in 1/2 of the control and experimental groups by isotope dilution kinetic techniques. There were no gross clinical changes in the experimental group throughout the study period. Percentages of chenodeoxycholic and lithocholic acids in the bile increased significantly in all treated animals. Those in the high-dose group showed maximum increases to over 80% chenodeoxycholic and 9% lithocholic acids with 1 month of treatment. Those in the low-dose and incremental-dose groups required 2-10 months to develop similar changes. Cholic and deoxycholic pools decreased significantly after 1 yr. Treated animals showed an increase in chenodeoxycholic acid pools of 181-943 mg and a decrease in the cholic acid pool of from 302-114 mg. Serum bilirubin, total protein with albumin-globulin ratio, calcium, and phosphorus remained normal. Serum cholesterol varied as a function of pregnancy in all animals. Treatment had no effect on serum cholesterol or cholesterol pool size. The SGPT, SGOT, 5'-nucleotidase, and alkaline phosphatase tests were good indicators of response to treatment. Of the 18 treated animals, 15 developed SGOT or SGPT levels over 75 IU and moderate to severe lesions. The low- and increment-dose animals took 5-11 months to reach this point, while the high-dose group took 1 1/2-3 months. In 9 the changes occurred synchronously and were accompanied by elevations of 5'-nucleotidase and alkaline phosphatase. When both enzymatic and histologic abnormalities had appeared in the 11, the percentage of chenodeoxycholic acid has risen to over 80% in 8, 60% in 2 and 45% in 1, and lithocholic acid had risen to 8-14%. It is concluded that chenodeoxycholic acid is hepatotoxic to baboons at 20-38 mg/kg/day.

5387 25-HYDROXYVITAMIN D_3: EVIDENCE OF AN ENTEROHEPATIC CIRCULATION IN MAN. *(E.)*

Arnaud, S. B.; Goldsmith, R. S.; Lambert, P. W.; Go, V. L. W. (Mayo Clin., Rochester, Minn.). *Proc. Soc. Exp. Biol. Med.* 149(2):570-572, 1975.

The intestinal and plasma distribution of i.v. administered 25-hydroxyvitamin D_3 was studied. Normal adults (3) were intubated with a triple-lumen nasoduodenal tube after an overnight fast. The first aperture was proximal to the ampulla of Vater, the second at the ligament of Treitz, and the third 30 cm distal to the second. Polyethylene glycol (5 g/liter) was perfused at 2 ml/min through the first lumen, and duodenal aspirates collected through the second for 30-36 hr. Samples were taken and reinfused through the third. Chromium sesquioxide (0.5 g daily) was started p.o. just prior to an i.v. bolus injection of 8-10 μCi of 26, 27-^{3}H-25-OH-D_3. Serial blood specimens and all urine and feces excreted for 12 days after injection were collected. Total ^{3}H in stool samples and duodenal aspirates were determined by liquid scintillation counting. Fecal data were corrected, on the basis of the chromium sesquioxide marker, to correspond to the appropriate blood and duodenal samples. To determine disappearance of ^{3}H-25-OH-D_3 from the blood, serum was extracted with methanol-chloroform, and chromatographed. Within 5 min of the injection of the labeled vitamin, 75-86% of the ^{3}H could be found in the plasma. During the first 6 hr, 45% of the dose disappeared from the plasma and 17.1% of the dose appeared in the duodenum. Plasma radioactivity dropped to 26.7% of the dose at 24 hr, while cumulative intestinal radioactivity doubled to 35.5%. Fecal radioactivity corresponding to the first 24.7 hr was 3.03% of the dose, indicating resorption of at least 85% in the duodenum. Total fecal excretion of ^{3}H (22.5% in 8.9 days) was much lower than the quantity of ^{3}H in the duodenum in the first 24 hr. Urinary excretion accounted for 1.47% after 24 hr, and 2.30% after 48 hr. The intestinal reabsorption of 25-hydroxyvitamin D_3 is indicative of an enterohepatic circulation that may be of physiologic importance. Interruption in the recycling of this vitamin D_3 metabolite may be an important mechanism of acquired vitamin D deficiency in gastrointestinal disease.

5388 DEUTERIUM TRANSFER FROM [1,1-^{2}H]ETHANOL DURING METABOLISM OF BILE ACIDS AND CYCLOHEXANONE IN THE ISOLATED PERFUSED RAT LIVER. *(E.)*

Cronholm, T.; Erliksson, H.; Matern, S.; Sjovall, J. (Kemiska Inst. Stockholm, Sweden). *Eur. J. Biochem.* 53(2):405-410, 1975.

Factors in the transfer of deuterium from (1,1-^{2}H)-ethanol to reduction products of cyclohexanone, 3-oxo-5β-cholanoic, and 3-oxo-4-cholenoic acids were studied in the isolated, perfused rat liver. Livers from Sprague-Dawley rats were perfused with 3-oxo-5β-cholanoic acid (males), or 3-oxo-4-cholenoic acid (females). The perfusate contained 12 ml blood diluted to 72 ml with Tyrode's solution, with a ^{2}H excess of 46 atoms% as ^2H_2O. Unlabeled or (1,1-^{2}H)-ethanol was added to give a concentration of 69 mM, and 1 mg 3-oxo-4-cholenoic acid or 1 mg 3-oxo-5β-(24-^{14}C) cholanoic acid (10^6 cpm) was added. Bile was collected in 1 hr portions, and lithocholic acid, 3-hydroxy-5β-cholanoic acid, and cyclohexyl glucuronide were extracted. With 3-oxo-5β-cholanoic acid as the substrate, lithocholic and chenodeoxycholic acids were usually found as metabolites, the former constituting 10-80% of the metabolites. No bile acids containing a 3-oxo group were found. Lithocholic acid formed from 3-oxo-5-β during (1,1-^{2}H)-ethanol perfusions contained 11% monodeuterated molecules, and none had more than one deuterium atom. Abundance of deuterated molecules was diminished by cycloserine or aminooxyacetate in the perfusion medium, and maleate, disulfiram, lactate, and malate caused a decrease in labeling. Abundance of monodeuterated cyclohexanol molecules was 49% during the metabolism of the labeled ethanol. Deuterium excess in cyclohexanol was increased by maleate, lactate, malate, and oleate. Abundance of monodeuterated lithocholic acid molecules formed in ^2H_2O medium (46 atoms % excess) was 26%, and an insignificant number had more than one deuterium atom. When the acid was oxidized and the product converted to *O*-methyloxime, abundance of monodeuterated molecules decreased to 2.8%, showing most of the deuterium in the acid was in the 3β position. There was no substantial loss of deuterium in the conversion of (2,2,4,4 ^{2}H)lithocholic acid into the *O*-methyloxime of the 3-oxo derivative. Unlabeled ethanol decreased abundance of monodeuterated lithocholic acid molecules to 21%; when (1,1-^{2}H)ethanol was present the abundance increased to 29%. Excreted 3α-hydroxy-5-cholanoate sulfate had a deuterium excess in 20 atoms % in the 3β position and of 24 atoms % in the C-2 and C-4 positions. It is concluded that different pools of NADPH are used for reduction of the 4,5 double bond and of the 3-oxo group.

5389 TWO DISTINCT PATTERNS OF GLUCOSE INTOLERANCE IN ICTERIC RATS AND RABBITS. RELATIONSHIP TO IMPAIRED LIVER MITOCHONDRIA FUNCTION.

(E.) Yamada, T.; Ida, T.; Yamaoka, Y.; Ozawa, K.; Takasan, H.; Honjo, I. (Kyoto Univ. Fac. Med., Japan). *J. Lab. Clin. Med.* 86(1):38-45, 1975.

The correlation between the degree of glucose tolerance and the degree of liver mitochondrial derangement was studied in animals with liver disease. Rabbits and Wistar rats had the common bile duct doubly ligated close to the liver, and the left branch of the portal vein ligated. P.o. glucose tolerance test was performed after a 15-hr fast in rats subjected to ligation for 3 weeks and rabbits subjected to ligation for 48 hr. Glucose (3 g/kg in rats and 2 g/kg in rabbits) in 20% solution was given intragastrically, and blood samples were taken at intervals up to 6 hr. Insulin tolerance was determined by i.v. injection of insulin (1 U/kg in rats, and 0.2 U/kg in rabbits). Liver mitochondria were assayed for oxygen consumption, phosphorylative efficiency, respiratory carrier content, protein, and respiratory control ratio. In icteric rats, blood glucose peak was reached in 2 hr, in contrast to 1 hr for controls, and was significantly higher (159 mg/dl) than in controls (137 mg/dl). The plasma immunoreactive insulin peak was reached in 1 hr, in contrast to 30 min for controls, and was significantly higher than in controls. In icteric rabbits, blood glucose level increased gradually for 6 hr to a significantly higher level. Plasma immunoreactive insulin response peaked at 3 hr, compared with 30 min for controls, and was significantly higher than in controls. In icteric rats, blood glucose and plasma immunoreactive insulin levels were not significantly different from controls. In icteric rabbits, blood glucose levels at 15 and 30 min after insulin injection were significantly higher than those in controls. In both rats and rabbits with ligated portal veins, phosphorylase/unit of cytochrome a $(+a_3)$ decreased rapidly to 15/sec in 24 hr and remained constant. In rats with bile duct ligation, the activity per unit of $a(+a_3)$ cytochrome fell to 20/sec in 2 weeks and remained constant. In the icteric rabbits, activity rapidly decreased to 10/sec in 24 hr after ligation. Respiratory control ratio, State 3 respiration, and phosphorylase activity/mg protein/min were significantly higher in icteric rats than those with ligated portal veins. Of the icteric rats, 90% lived beyond three weeks, while nearly all the icteric rabbits died within three days. It is concluded that glucose intolerance in icteric rats and rabbits is related to severity of liver mitochondrial derangement.

5390 SPECIFIC DEUTERIUM LABELLING AND COMPUTERIZED GAS CHROMATOGRAPHY-MASS SPECTROMETRY IN STUDIES ON THE METABOLISM IN VIVO OF A STEROID SULPHATE IN THE RAT.

(E.) Baillie, T. A.; Eriksson, H.; Herz, J. E.; Sjovall, J. (Dep. Chem., Karolinska Inst., Stockholm, Sweden). *Eur. J. Biochem.* 55(1): 157-165, 1975.

Specific deuterium labeling and computerized gas chromatography-mass spectrometry were used to study the metabolism of allopregnan-3β-01-20-one sulfate in bile fistula rats and in isolated perfused rat livers. The deuterium-labeled steroid (about 0.5 mg) was dissolved in 50% ethanol and isotonic glucose solution and injected i.v. into male and female Sprague-Dawley rats with bile fistulas. The steroid, again dissolved in ethanol and isotonic glucose, was added to the perfusate 20-100 min after the start of perfusion of isolated livers. The biliary steroids in each case were extracted from the bile samples collected during steroid treatment, purified, and analyzed by gas-liquid chromatography and combined gas chromatography-mass spectrometry. The male rats excreted a-lopregnan-3β-01-20-one sulfate metabolites into the bile more rapidly than did the females, an observation which was correlated with the preferential formation of glucuronide conjugates in the male liver. The major metabolic pathway in the males involved hydrolysis, 2α-hydroxylation, oxidoreduction at C-3, and glucuronide conjugation, to yield 2α,3α-dihydroxy-5α-pregnan-20-one glucuronide as the major metabolite; only traces of the injected steroid sulfate were detected in bile from male rats. In contrast, the injected steroid sulfate was the major steroid excreted in the bile of the female rats; in this case, the primary metabolite was identified as 3β,15β-dihydroxy-5α-pregnan-20-one sulfate. A minor metabolite, 3β,16α-dihydroxy-5α-pregnan-20-one, was found as a monosulfate in the females and as both a disulfate and a glucuronide conjugate in the males. The deuterium content of the sulfated 15β- and 16α-hydroxylated metabolites was consistent with metabolic pathways involving direct hydroxylation of the injected steroid sulfate. Similar results were obtained in the liver perfusion experiments, which indicates that all the observed metabolic reactions took place in the liver. The results demonstrate the advantages associated with the use of stable isotopes in studies of steroid metabolism.

5391 SERUM CALCIUM AND HEPATIC KUPFFER CELL PHAGOCYTOSIS.

(E.) Ryder, Jr., K. W.; Kaplan, J. E.; Saba, T. M. (Albany Med. Coll., N.Y.). *Proc. Soc. Exp. Biol. Med.* 149(1):163-167, 1975.

The effect of experimental alterations of serum calcium levels on opsonin-mediated hepatic phagocytosis was investigated in male Holtzman rats. Serum calcium concentration was altered by the addition of calcium chelators (oxalate, citrate, and EDTA) or by the addition of exogenous calcium. The test colloid used for the phagocytic studies was gelatinized "reticuloendothelial test lipid emulsion"; hepatic phagocytosis was assayed *in vitro* using an isotopic liver slice technique. Upon the addition of oxalate, phagocytosis was depressed in proportion to the amount of oxalate added. At the highest concentration of the chelator (2 μM/ml serum), phagocytosis was 49.6% of control with oxalate, 35.8% of control with citrate, and 48.3% of control with edetic acid. When exogenous calcium was added to serum pretreated with oxalate or citrate, enhancement of phagocytosis occurred with calcium levels up to normal; at calcium levels above normal, there was a significant depressant effect on phagocytosis. The findings suggest that alterations of serum calcium may induce significant changes in reticuloendothelial function which may produce a state of altered host resistance.

5392 LIVER REGENERATION: AN ISOLATION PERFUSION SYSTEM EMPLOYED TO ASSAY HEPATIC ^{3}H-THYMIDINE INCORPORATION. *(E.)*

Sera, Y.; McLeod, J. W.; Koga, Y.; Nicolson, M. O.; Hays, D. M. (Child. Hosp. Los Angeles, Calif.). *Proc. Soc. Exp. Biol. Med.* 149(1):294-298, 1975.

The ability of hepatic cells to incorporate a labeled DNA precursor was studied using an isolation-perfusion apparatus. Male Sprague-Dawley rats were subjected to either a 68% hepatic resection or sham-hepatic mobilization. Isolated, whole normal rat livers were perfused with 2 types of suspension, perfusate that had passed through a regenerating liver and perfusate that had passed through a "sham" operated liver. After the initial 10 min of perfusion, 125 μCi thymidine-me-^{3}H was introduced into the perfusate, and perfusion was continued for 60 min. The livers were then removed and small pieces were fixed for autoradiographic studies; DNA was extracted from the remaining liver. Isolated normal livers perfused with suspension which had been previously circulated through either regenerating or sham-operated livers showed equal and relatively low levels of both tissue specific activity and nuclear labeling. When fresh perfusates were circulated through regenerating livers, nuclear uptake was apparent and specific activity was increased more than 100 times that found in similarly perfused sham-operated livers. No evidence of a factor which can rapidly increase the ^{3}H-thymidine uptake in a perfused normal liver was detected in these studies. The hepatic perfusion system represents a method of demonstrating the capacity for active DNA synthesis in liver cells, employing perfusion as a substitute for i.v. or i.p. injection of labeled compounds in intact animals.

5393 EFFECT OF INTRA-ARTERIAL INFUSION OF VASOPRESSIN ON HEPATIC ARTERY FLOW. *(E.)*

Fingeroth, R. J.; Storer, E. H.; Ramsby, G. R.; Conn, H. O. (VA Hosp., West Haven, Conn.). *Surg. Forum* 24:399-402, 1973.

The possibility of hepatic ischemia developing secondary to decreased hepatic artery blood flow after vasopressin administration was studied in 15 dogs. Noncannulating electromagnetic flow probes were used to monitor blood flow through the hepatic and splenic arteries and portal veins following the intraceliac infusion of 10 U of vasopressin. The preinfusion and postinfusion angiograms of ten patients undergoing therapeutic intraceliac vasopressin infusion were also studied. Upon the arrival of vasopressin in the celiac axis, hepatic artery flow fell to 65% of baseline values, and splenic artery flow fell to 50% of baseline values. Over the next min, the systemic blood pressure rose to 134% of baseline values and the portal vein flow fell to 51% of baseline values. As the portal vein flow decreased, the hepatic artery flow increased, reaching a mean value of 136% of baseline values. This state remained constant throughout vasopressin infusion, with all flows returning to baseline values postinfusion. In the ten human patients, the postvasopressin infusion angiograms showed no change, or showed an actual increase in hepatic artery diameters, while the splenic, gastric, and gastroduodenal arteries showed marked distal vasoconstriction. It is concluded that hepatic artery infusion of vasopressin is not hazardous provided compensatory dilatation occurs as documented by angiography after a brief trial infusion.

5394 COPPER METABOLISM AFTER BILIARY FISTULA, OBSTRUCTION, OR SHAM OPERATION IN RATS. *(E.)*

Owen, C. A., Jr. (Dep. Biochem., Mayo Clin., Rochester, Minn.). *Mayo Clin. Proc.* 50(7):412-415, 1975.

The excretion of copper was studied after biliary obstruction in male Sprague-Dawley rats. The animals were subjected to surgical procedures whereby the bile duct was cannulated and the cannula was threaded out through the skin, the bile duct was doubly ligated and the intervening segment resected, or laparotomy and exposure of the bile duct was followed by simple resuturing of the wound (sham operation). All rats were given vitamin K (0.5 mg) s.c. every other day and i.v. ^{67}Cu (1 μCi) injections. The carrier-free ^{67}Cu appeared rapidly in the bile of the rats with recently-created bile fistulas, maximum excretion occuring within the first 2 hr. However, in animals in which the biliary fistula had been created 3-4 days previously, only one to one-half as much of the isotope appeared in the bile. There was also a small decrease in stable biliary copper in these rats. When the biliary fistula rats were compared over a period of 6 weeks to those with permanent biliary obstructions, both groups exhibited a marked increase in plasma copper and an equally pronounced increase in plasma *p*-phenylenediamine oxidase activity; there was no increase in hepatic copper. Peaks in the blood copper levels were reached within 2 weeks and then slowly diminished. In the sham-operated rats, the copper and enzyme changes paralleled those in the other groups but were much less marked. The results suggest that in inherited copper retention (Wilson's disease) or acquired copper retention (primary biliary cirrhosis), there may be a pathogenic abnormality in the bile which induces copper retention in these diseases. The results also suggest that the absence of bile in the gut alters copper metabolism.

5395 ULTRASTRUCTURAL CHANGES IN RAT HEPATOCYTES FOLLOWING ACUTE METHYL MERCURY INTOXICATION. *(E.)*

Desnoyers, P. A.; Chang, L. W. (Dep. Pathol., Univ. Wisconsin, Madison). *Environ. Res.* 9(3):224-239, 1975.

The pathological and morphological effects of acute and chronic methyl mercury intoxication on the rat liver were studied. Male Sprague-Dawley rats were given up to four consecutive daily s.c. injections of methylmercuric chloride at a dosage of 10 mg/kg. The animals were fasted for 24 hr before sacrifice and were killed 1, 5, 10, 24, 48, or 96 hr after the beginning of methyl mercury treatment. Ultrathin sections of the livers were examined by electron microscopy. No neurological symptoms were observed in any of the animals. Grossly, the livers appeared atrophied and adhesion of the liver to the visceral organs occured after the second injection. Ultrastructural changes in the hepatocytes were observed as early as 5 hr after the initial mercury injection; these included a wavy appearance of the mitochondrial membrane, dilatation of the rough endoplasmic reticulum, and occasional accumulation of electron-dense granules (liposomes) near the bile canaliculi. After 24 hr, there was a general depletion of glycogen and focal amorphous areas appeared in the cytoplasm of many cells. Large areas of cytoplasmic degradation were also observed and cellular materials were frequently observed to be extruded into the hepatic sinusoids. Extensive matrical swelling of the mitochondria with concomitant loss of the mitochondrial granules were observed after 2 days; breakage of the outer mitochondrial limiting membranes, loss of the mitochondrial cristae, and an increase in the number of lysosomes were also noted at this time. Sequestration of cytoplasmic organelles, many of them degraded, within the hepatocytes to form large membrane-limited cytosegresomes was observed after 4 days. Degenerated organelles, Kupffer cells and cellular debris were frequently found extruded into the hepatic sinusoids and moderate fatty changes in some hepatocytes were observed. The data indicate that the most extensive degenerative changes in the liver occur after 2 days of methylmercury administration.

5396 TECHNETIUM ^{99m}-PYRIDOXYLIDENEGLUTAMATE: A NEW HEPATOBILIARY RADIOPHARMACEUTICAL. I. EXPERIMENTAL ASPECTS.

(E.) Baker, R. J.; Bellen, J. C.; Ronai, P. M. (Inst. Med. Vet. Sci., Adelaide, South Australia). *J. Nucl. Med.* 16(8):720-727, 1975.

The electrophoretic behavior, *in vivo* distribution, toxicity, and reabsorption of technetium-99m-pyridoxylideneglutamate (^{99m}Tc-PG) were studied in balb/c mice and female rats to determine the potential of this radiopharmaceutical for the scintigraphic diagnosis of biliary tract disorders in man. Labeling of pyridoxal and the pyridoxylidene derivative of glutamic acid with ^{99m}Tc was achieved by a simple autoclaving procedure, after which the autoclaved reaction mixture was examined using electrophoresis on cellulose acetate membrane. The compound (75 to 500 μCi) was injected i.v. into balb/c mice and dogs, and its biliary and urinary excretion and tissue distribution were studied; the acute toxicity of PG was also determined in mice, and its antigenicity was studied in guinea pigs. In the reabsorption experiments, radioactive bile from a donor rat given i.v. ^{99m}Tc-PG was injected into the duodenum of a recipient rat and the radioactivity in the blood, bladder, bile and urine was determined at 15-min intervals. Both scintigraphic and quantitative distribution studies showed that ^{99m}Tc-PG passed rapidly through the mouse liver with progressive accumulation in the gallbladder, allowing visualization of this organ within 10 min of injection. Within 30 min, over 40% of the injected dose was excreted into the intestine with an equivalent amount appearing in the urine; renal activity was low. Scintigraphic studies in dogs yielded similar results. The LD_{50} of this compound in mice was about 1,400 mg/kg, but there were no apparent toxic reactions or histological changes noted after the cumulative administration of 2,820 mg/kg in ten equal doses. The preparation was sterile, pyrogen-free, and did not produce an antigen reaction in guinea pigs. In the reabsorption experiments, the radioactivity appearing in the blood of the recipient at 2 hr reached 0.02% of the dose/ml; no activity was observed in the bladder at this time. It is concluded that ^{99m}Tc-PG would be a suitable agent of low toxicity for use in humans for the investigation of biliary tract disorders.

5397 ENDOTOXIN-INDUCED LIVER NECROSIS AND INTRAVASCULAR COAGULATION IN RATS ENHANCED BY PORTACAVAL COLLATERAL CIRCULATION.

(E.) Liehr, H.; Grun, M.; Thiel, H.; Burnswig, D.; Rasenack, U. (Dep. Med., Univ. Wurzburg, Germany). *Gut* 16(6):429-436, 1975.

The effects of i.v. endotoxin on the hepatic and systemic circulation and on the coagulation system were evaluated in normal, non-fasted FW 49 rats and in rats with experimental portal hypertension or portacaval anastomosis. Endotoxin (1.5 mg/kg) was injected into the penile vein and the cardiac output and hepatic blood flow were measured. Coagulation factors II, V, VII, and X were also determined, as were the fibrinogen level and platelet count, the activities of SGOT and SGPT, phagocytic activity, and the serum bilirubin and blood sugar concentrations. Specimens of liver, lungs and kidney were examined histologically. In the normal rats, endotoxin administration led to a prompt increase in the serum transaminase activity and to a hyperdynamic circulation with a consequent increase in the total hepatic blood flow. Six hr later, the hepatic artery dilated with a subsequent hepatic arterial hyperperfusion. The coagulation system was also affected, with signs of consumption coagulopathy. Endotoxin treatment resulted in acute liver necrosis within 12-15 hr in the rats with portal hypertension and portacaval collaterals as well as in those with portacaval anastomosis. The hepatic artery became overdilated with a cardiac output fraction of 25%, compared to a normal value of 5.5%. Blood extravasates and thrombi, rich in fibrin, were detected in the liver. Hypocoagulation, greatly elevated transaminase activity, and greatly reduced blood sugar levels were also observed. It is suggested that the exaggerated endotoxin effect in these rats was due to an impairment in the clearance function of the reticuloendothelial system, probably as a consequence of portacaval collateral circulation. It is concluded that endotoxins damage the liver, even in normal organisms, that they are potent inducers of acute liver necrosis if the reticuloendothelial system is altered, and that they should be considered in the pathogenesis of acute and chronic liver diseases.

5398 MORPHOLOGICAL FINDINGS IN SWINE LIVER HOMOGRAFTS AFTER ORTHOTOPIC AND AUXILIARY HETEROTOPIC TRANSPLANTATION.

(Ger.) Seidler, D.; Trautwein, G.; Lauchart, W.; Bockhorn, H. (Veterinary Med. Coll., Hannover, Germany). *Z. Immunitaetsforsch.* 148(1):1-15, 1974.

Morphological and immunohistochemical studies were performed on the livers of donor and recipient swine before and after transplantation and after the death of the recipient, 2 days to 1.5 yr later. Orthotopic transplants were performed on 20 swine and heterotopic auxiliary transplants on ten. No immunosuppressive agents were employed. Gross examination of the livers of swine that died within 5 days after surgery revealed hepatomegaly and changes in blood supply. One animal had a completely necrotic left lobe with no signs of a thrombus in branches of the hepatic artery or portal vein supplying this area. In swine surviving 5 days to 3 weeks, boundaries between the lobes and the periportal fields were more clearly defined than in normal animals; almost half of the swine had hepatomegaly. Rejection was manifested by parenchymal bleeding and small areas of necrosis which gave cut sections a variegated appearance. Of the swine receiving orthotopic transplants, 2 developed total and 2 others partial stenosis of the common bile duct near the suture line and intrahepatic cholestasis. In swine surviving longer than 3 weeks, periportal fields became wider, the hepatic capsule was thickened and fibrotic, and lobular architecture was lost. Nonspecific histological changes found immediately after surgery included marked dilatation of central veins and sinusoids, centrilobular hepatocyte dissociation, and Kupffer cell activation. Large centrilobular vacuoles, nuclear degeneration, isolated cellular necrosis, and edema of periportal tissue were observed in swine that died within 5 days after surgery. In animals that survived longer, lymphocyte infiltrations, isolated cellular necrosis, and fibrotic widening of the boundaries between lobules were detected. Other nonspecific changes included leukocyte infiltration of the bile ducts and bile duct proliferation which developed in association with stenosis and partial stenosis of the common bile duct. Morphological changes resulting from immunological differences between the donor and recipient varied with the survival time and the intensity of the immune reaction; no appreciable differences were found between orthotopic and auxiliary heterotopic transplants. These changes consisted of lymphocyte infiltration beginning in the portal triads and eventually resulting in fibrosis. The fluorescent antibody technique failed to demonstrate that humoral antibodies participate in the rejection reaction.

5399 IS GLUCOSE THE PORTAL HEPATOTROPHIC SUBSTANCE? *(E.)* Mooney, C. S.; Griffen, W. O., Jr. (Univ. Kentucky Med. Cent., Lexington). *Surg. Forum* 24:379-381, 1973.

The possible role of glucose in preventing liver shrinkage following substitution of systemic for portal venous blood was studied in adult dogs. Partial portacaval transposition was performed in each animal so that the right hepatic lobe received splanchnic venous blood while the left lobe received systemic venous blood. For five days following surgery, the dogs were given commercially available horse meat once daily and water *ad libitum*. For five hr after eating, half of the dogs received 500 ml of saline at a rate of 100 ml/hr i.v. in a hind limb; the others received a similar amount of 5% dextrose in saline. There were no significant alterations in the SGOT, bilirubin, or alkaline phosphatase values after surgery in any of the animals, and all maintained their appetite and weight throughout the study. At 60 days after surgery, the right liver lobes appeared normal in all dogs and the left lobes appeared normal in the glucose group. The left lobes in the saline group were paler, significantly smaller, and firmer than normal, weighing on an average only 249 g compared to 410 g in the glucose group. Histologically, the portions of liver receiving splanchnic blood were normal; the left lobes in the glucose group showed some mononuclear infiltration at the portal triads, and the left lobes of the saline group showed increased fibrous tissue and small, irregular, darker hepatocytes. The results support the hypothesis that depriving the liver of portal venous inflow leads to a "starvation" sequence; that portion of the liver which does not receive postprandial glucose-laden blood cannot metabolize and store glycogen and therefore undergoes shrinkage. The role of insulin in this process appears to be less critical than exposure of the hepatocytes to glucose.

5400 LIVER, BILIARY SYSTEM, AND GASTROINTESTINAL MUCOSA: SITE OF ORIGIN OF THE HEPATOTROPHIC PORTAL BLOOD FACTOR INVOLVED IN LIVER REGENERATION. *(E.)* Sgro, J. C.; Charters, A. C.; Chandler, J. G.; Grambort, D. E.; Orloff, M. J. (Univ. California, San Diego Sch. Med., La Jolla). *Surg. Forum* 24:377-379, 1973.

Liver regeneration was examined in male Lewis rats after selective ablation of the splanchnic organs to study the site of origin of the hepatotrophic portal blood factor responsible for liver regeneration. All animals were starved for 48 hr then subjected to 70% hepatectomy. In addition, some were subjected to small-intestine resection; resection of the spleen, stomach, duodenum, and pancreas; resection of the stomach, spleen, and duodenum; pancreatectomy; or gastrectomy. Biliary and gastrointestinal continuity were reestablished by anastomoses. All animals were killed 24 hr after surgery, having been injected i.p. with tritiated thymidine (250 µc) 30 min prior to sacrifice. The mitotic index, labeled nuclei, and DNA uptake of ^{3}H-thymidine were examined in the remnant liver. Marked regenerative activity of the residual liver segment was evident in the animals which had undergone hepatectomy, hepatectomy plus small-intestine resection, and hepatectomy plus gastrectomy, the magnitude of the response being reduced in the latter 2 groups compared with the first group. No regenerative activity was noted after hepatectomy plus removal of the stomach, spleen, pancreas, and duodenum, or after hepatectomy plus removal of the stomach and duodenum or the pancreas alone. The data indicate that the hepatotrophic portal blood factor is not a nutrient substance absorbed from the gastrointestinal tract. They also suggest that the site of origin of this factor is not the small intestine or stomach, although the pancreas and/or duodenum may prove to be the source of this humoral factor.

5401 ANIMAL MODEL OF HUMAN DISEASE: CHRONIC BILIARY OBSTRUCTION. *(E.)* Stanley, N. F.; Joske, R. A. (Dep. Microbiol., Univ. West. Australia, Nedlands). *Am. J. Pathol.* 80(1):185-187, 1975.

A murine model is described which might be used to study the clinical and pathologic features of chronic biliary obstruction in man. Nonbacterial infections producing chronic biliary obstruction in humans are at present an enigma. Obstruction may result from a viral hepatitis-induced cholestatic syndrome, fibrous strictures at the lower end of the common bile duct in the absence of either pancreatitis or cholelithiasis, or from viral infections which produce biliary obstructions secondary to viral pancreatitis. The i.p. inoculation of weanling mice with massive doses of reovirus Type 3 resulted in a 40% incidence of chronic obstructive jaundice within 3 or more weeks. Jaundice resulted from the obstruction of the common bile duct at the duodenal end following denudation of the bile duct mucosa. One week after inoculation, reovirus was observed replicating in the bile duct mucosal cells, but no infective virus could be detected at 3 weeks. Virions passed both the sinusoidal and hepatic layers before reaching the common bile duct, the cells lining its lumen being invaded when the viral titer in the duct became high enough. The cellular necrosis and inflammatory response to virus invasion were followed by fibrosis in the terminal portion of the common bile duct. The subsequent stricture formation and obstruction of flow in the common bile duct were responsible for the hepatic and pancreatic lesions seen in the later stages of the disease. This model suggest that some cases of biliary obstruction at the ampulla of Vater might occur following viral choledochitis. A combined clinical and epidemiologic approach with attempted virus isolation from blood and feces, as well as viral and electron microscopic study of possible surgical specimens, might aid in the study of chronic biliary obstruction in man.

5402 RAPID UPTAKE BY LIVER SINUSOIDAL CELLS OF SERUM ALBUMIN MODIFIED WITH RETENTION OF ITS COMPACT CONFORMATION. *(E.)* Buys, C. H. C. M.; De Jong, A. S. H.; Bouma, J. M. W.; Gruber, M. (Biochem. Lab., Univ. Groningen, The Netherlands). *Biochim. Biophys. Acta* 392(1):95-100, 1975.

The conformation and blood clearance of nitroguanidinated albumin were studied using nitroguanidinated bovine serum albumin and native albumin, labeled with ^{125}I and injected into rats. The radioactivity in the plasma and liver were determined in the first hours after injection, and the subcellular localization of the protein was compared with that of the lysosomal enzymes acid phosphatase and cathepsin D. The nitroguanidination-induced changes in the albumin molecule were studied by gel filtration on Sephadex G-200 and by chemical characterization of native, nitroguanidinated, and formaldehyde-treated albumin. Nitroguanidination resulted in replacement of the positively-charged amino groups on the albumin molecule by neutral nitroguanido groups. However, there was no significant folding of the modified albumin molecule and the number of reducible disulfide groups was not appreciably increased. Like formaldehyde-denatured albumin, but in contrast to the native protein, the nitroguanidinated derivative was rapidly cleared from the blood *in vivo* and was taken up in the lysosomes of the liver sinusoidal cells. It is concluded that extensive denaturation is no prerequisite for the uptake of albumin derivatives by the liver sinusoidal cells. It is further suggested that the nitroguanidinated protein, in contrast to native albumin, is bound on membrane receptors of these cells. The nitroguanidine groups themselves may be bound on these receptors, but it seems equally possible that binding on the receptors is the result of a net increase in the negative charge of the albumin molecule or of local conformational changes in the protein.

5403 EFFECT OF DECREASED GALLBLADDER STIMULATION ON ENTEROHEPATIC CYCLING AND KINETICS OF BILE ACIDS. *(E.)* Hepner, G. W. (Milton S. Hershey Med. Cent., Pennsylvania State Univ., Hershey). *Gastroenterology* 68(6):1574-1581, 1975.

The effect of dietary protein and fat on the rate of enterohepatic recycling and bile acid kinetics was studied in patients with cholesterol cholelithiasis, in cholecystectomized patients and in control subjects. The effect on enterohepatic cycling was assessed indirectly by comparing the 24-hr output of breath $^{14}CO_2$ after administration of 2 μCi of cholyl (1-^{14}C)glycine during two periods: a control period when three meals containing protein and fat were eaten daily; and a diet period, when protein and fat were excluded from the diet for a period of 72 hr. Bile acid kinetics after the p.o. administration of (2,4-^{3}H)cholic acid and (24-^{14}C)chenodeoxycholic acid were measured in six healthy subjects during a control period and again, not less than 4 months later during the fourth week of a dietary program in which one meal containing fat and protein was consumed every other day. In the first study, breath $^{14}CO_2$ output was not altered by diet in the cholecystectomy patients. In the healthy subjects and in the patients with cholesterol cholelithiasis, however, the breath $^{14}CO_2$ output fell by about 50%; this indicated that decreased endogenous cholecystokinin-pancreozymin stimulation had reduced but not eliminated enterohepatic recycling in these subjects. In the second study, the pool size of cholic and chenodeoxycholic acid in the bile rose significantly during the low fat and protein diet; the total bile acid pool size also decreased. The daily fractional turnover rate of both primary bile acids fell significantly during the diet, but their rate of synthesis was not significantly changed. It is concluded that significant enterohepatic circulation of bile acids occurs even in the absence of dietary stimuli for gallbladder contraction and that diet may significantly affect bile acid pool size and fractional turnover, while bile acid synthesis remains essentially unaffected.

5404 HEPATIC BLOOD FLOW AND OXYGEN CONSUMPTION IN STARVATION, SEPSIS AND SEPTIC SHOCK.

(E.) Imamura, M.; Clowes, G. H. A., Jr. (Harvard Med. Sch., Boston, Mass.). *Surg. Gynecol. Obstet.* 141(1):27-34, 1975.

The normal pattern of hepatic circulation and oxygen consumption in the fasted state was compared with that observed during sepsis. Sepsis was induced in male and female pigs by cecal ligation, which produced a fulminating i.p. abscess containing coliform organisms. Prior to the induction of sepsis, the pigs were fasted for 4 days, thermodilution catheters being inserted into the portal vein and inferior vena cava on the third day; silastic tubes were also inserted into the external jugular vein, the common carotid artery, and the left common hepatic vein. On the fourth day, measurements of cardiac output, arterial blood pressure, heart rate, inferior vena cava pressure, portal venous pressure, total hepatic blood flow, portal blood flow, and body weight were carried out in the fully conscious animals. The cecum was then ligated and after 3 more days, these measurements were repeated. In the septic high output state (in which the pig showed a higher cardiac output in the septic state than in the normal fasted state), the average cardiac output was 155% of that during normal fasting, the hepatic arterial flow increased 96%, the portal flow decreased 19%, the total hepatic flow increased 14%, the ratio of total hepatic blood flow to cardiac output decreased from 42% (normal fasted state) to 30%, and the total hepatic oxygen consumption increased 26%. In the low output state (in which the pig showed a lower cardiac output in the septic state than in the normal fasted state), the hepatic arterial flow decreased 74%, the portal flow decreased 23%, the total hepatic flow decreased 38%, the cardiac output decreased 38%, the ratio of total hepatic blood flow to cardiac output was 31%, total hepatic oxygen consumption decreased 29.1%, and splanchnic oxygen consumption decreased 22%. Only one of 11 pigs in the septic high output group died during the 3 days of observation, while 11 of 16 in the septic low output group died during this period. The remarkable difference in survival between the septic high and low output groups appeared to be largely due to the significant decrease in hepatic arterial flow and oxygen supply to the liver in the low output state.

5405 FORMATION OF COLONIES IN SOFT AGAR MEDIUM BY REGENERATING LIVER CELLS.

(E.) Hays, D. M.; Sera, Y.; Koga, Y.; Hays, E. F. (Univ. South. California Sch. Med., Los Angeles). *Proc. Soc. Exp. Biol. Med.* 148(2):596-599, 1975.

The effect of serum factors, which have been shown to be stimulatory for marrow cells, on the colony-forming properties of cells from regenerating liver tissue was studied. Regenerating liver tissue was obtained from male Fischer rats and male C57BL/6 mice; this tissue was minced, trypsin-dispersed and cultured in soft agar medium. Designated cultures were supplemented with 40 µl of normal mouse serum (NMS), endotoxin mouse serum (EMS, obtained after the i.v. inoculation of endotoxin), or endotoxin rat serum (ERS). Normal liver cells, bone marrow cells from mature mice, and fetal rat and mouse liver cells were similarly treated. In the rat cell cultures, the greatest number of colonies was obtained from liver tissue obtained 48 hr after resection, the number of colonies being increased by a larger cell inoculum and being inversely related to the animal's weight. The effects of added EMS or ERS and the substitution of 15% human or rat serum for the normal 15% fetal calf serum additive were negligible. In the mouse cell cultures, colonies were obtained only from tissue obtained 72 to 168 hr postresection. These colonies were larger than those formed from regenerating rat liver. Only regeneration and fetal mouse liver formed a significant number of colonies in the absence of EMS or NMS; in the presence of these serum factors, the greatest number of colonies was formed by bone marrow, with fetal and regenerating liver yielding smaller and similar numbers of colonies. The cellular composition of these colonies was clearly distinguishable as granulocytic, granulocytic-macrophage, or macrophage. An additional colony type seen only in regenerating mouse liver cultures contained sheets of apparently epitheloid cells. The cell type of the rat liver colonies could not be clearly identified. The results indicate that regenerating mouse liver contains cells which can form granulocyte or macrophage colonies in soft agar in the presence of NMS or EMS. It appears that there is a nonhematopoietic cell population in regenerating liver that can also form colonies.

5406 ACTIVITIES OF HEPATIC MICROSOMAL ELECTRON TRANSPORT SYSTEM IN PROLONGED ETHANOL-TREATED RATS.

(E.) Nakanishi, S.; Shiohara, E.; Tsukada, M.; Kinoshita, G. (Fac. Med., Shinshu Univ., Matsumoto, Japan). *Jpn. J. Pharmacol.* 25(1):71-73, 1975.

The activities of the main components of the hepatic microsomal electron transport system were studied in rats given prolonged ethanol treatment in the presence of aminopyrine or aniline. Wistar rats were given ethanol p.o. *ad libitum*, fasted 12 hr and sacrificed. Cytochrome P-450 and b_5 content, cytochrome P-450 reductase activity, cytochrome C reductase and NADPH oxidase activity, and microsomal protein content were determined. Cytochrome P-450 reductase, cytochrome C reductase, and NADPH oxidase activities increased significantly in the absence of drug substrate, compared to controls. Cytochrome P-450 reductase and cytochrome C reductase activities increased significantly in the presence of 3 mM of aminopyrine as compared to controls. With cytochrome P-450 reductase, there was no difference in the rate of reduction of the cytochrome in the presence of aminopyrine. The rate of cytochrome P-450 reduction was similar to that of controls in the presence of 2 mM of aniline. NADPH cytochrome C reductase activity was significantly higher than that of controls. The inhibitory effect of aniline was higher in the treated than in the control group. It is concluded that part of the cytochrome P-450 fraction increased by ethanol treatment is qualitatively different than that of controls.

5407 SYNCHRONIZED LIVER CELLS: A NEW TOOL FOR ANALYSIS OF CELL-CYCLE DEPENDENT CARCINOGEN-BINDING TO DNA IN VIVO. *(E.)*

Rabes, H. M.; Iseler, G.; Tuczek, H. V.; Kerler, R. (Pathol. Inst., Univ. Munich, Germany). *Experientia* 31(6):686-687, 1975.

A qualitative comparison was made between the degree of DNA alkylation prior to, during and after DNA replication *in vivo*. Four groups of six Wistar rats each were 2/3 hepatectomized and given i.p. N,N-di(^{14}C)methyl-nitrosamine (0.18 Ci/mM), and ^{3}H-thymidine (0.8 Ci/g; 5 Ci/mM). The first group was partially hepatectomized prior to the injections. The second group was given the injections during continuous infusion of hydroxyurea, 28 hr after hepatectomy. The third group was given injections 43 hr after partial hepatectomy and four hr after stopping a hydroxyurea infusion (14 to 39 hr after hepatectomy); the fourth group was given the injections 47 hr after hepatectomy, and eight hr after stopping the infusion. Radioactivity from the two labels was measured separately by liquid scintillation spectrometry. The specific activity of DNA from the ^{3}H-thymidine was low in the G_1 phase, and also during hydroxyurea-induced DNA synthesis inhibition at 28 hr after hepatectomy. DNA synthesis showed a high rate 4 hr after removal of hydroxyurea blockage; it was reduced again by 8 hr after, when the cells were in G_2. The specific activity of ^{14}C in the G_1 phase and during hydroxyurea inhibition was low and without significant difference. DNA incorporation of ^{14}C increased significantly 4 hr after removal of hydroxyurea blockage. Specific activity remained at increased levels, even at 8 hr after, when the cells were in G_2. It is concluded that ^{14}C uptake varies with cell cycle phase, implying differing sensitivity to carcinogen-induced base alkylation.

5408 MICROFILAMENT DYSFUNCTION AS A POSSIBLE CAUSE OF INTRAHEPATIC CHOLESTASIS. *(E.)*

Phillips, M. J.; Oda, M.; Mak, E.; Fisher, M. M.; Jeejeebhoy, K. N. (Toronto Gen. Hosp., Canada). *Gastroenterology* 69(1):48-58, 1975.

The possible function of pericanalicular microfilaments in the regulation of bile canalicular structure and function was investigated. Cultured rat hepatocytes, isolated perfused rat liver, and *in vivo* perfused rat liver were used as models. The cells were cultured with either cytochalasin B (20 μg/ml), 0.8% dimethylsulfoxide (DMSO) or phosphate buffer only (final concentration 0.0015 M). Samples were taken for electron microscopy at 1, 3, and 6 hr of incubation. Isolated liver was perfused for two hr, then 100 to 150 μg/ml of cytochalasin B and 0.2% DMSO were added to the perfusate. Bile was collected from the common duct and the volume was recorded hourly. Biopsies were taken 30 min, and 1, 2 and 3 hr after addition of the drug. In the *in vivo* experiment, bile flow was measured by common bile duct cannula for two hr. The liver was then perfused with 0.9% NaCl containing 100 μg/ml of cytochalasin B and 0.2% DMSO for one hr. Controls were given the NaCl with DMSO only. Biopsies were taken at 1, 2, and 3 hr after the start of perfusion. About 20-30% of the cultured hepatocytes were paired; they were joined by junctional complexes contiguous with the canaliculi. Light microscopy showed barely visible canicular luminal spaces in the controls, but widely dilated luminal spaces in the treated cells within 3-6 hr. Electron microscopy showed that the numbers of canalicular microvilli decreased steadily after 1 hr of treatment. In the isolated liver, light microscopy showed canalicular dilation, sinusoidal congestion, and fine hepatocytic vacuolarization. Electron microscopy 30 min after treatment showed dilated canaliculi, mostly in the periportal and midzonal regions, with microvillar loss. The pericanalicular ectoplasm was granular and amorphous. After 2 to 3 hr, the changes were panlobular. The cytoplasmic vacuoles contained mostly electron lucent material; the Golgi bodies were prominent. The overall cytoarchitecture was retained. Bile flow decreased over 75% after perfusion of a 100 μg/ml dose of the drug, and was virtually arrested after the 150 μg/ml dose. The *in vivo* liver did not show the cytoplasmic vacuoles and congestion of the isolated liver. Dilation of the canaliculi coincided with significant bile flow reduction. Microvilli were reduced, and autophagic vacuoles containing fibriliar and/or electron-dense material were seen in the panicanalicular area. One hr after treatment, bile flow was reduced 50% and nearly or completely arrested after 2 hr. It is concluded that the microfilaments maintain the canaliculi in a contracted or partially contracted state, and that their disruption is linked to bile flow reduction by an unknown mechanism.

5409 PLASMA DISAPPEARANCE OF RADIOACTIVITY AFTER INTRAVENOUS INJECTION OF LABELED BILE ACIDS IN MAN. *(E.)*

Cowen, A. E.; Korman, M. G.; Hofmann, A. F.; Thomas, P. J. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 68(6):1567-1573, 1975.

The kinetics of the disappearance of free and conjugated bile acids from plasma were studied. Each of six healthy volunteers received i.v. six bile acids (cholic and chenodeoxycholic acids and their glycine and taurine conjugates) in random order. The dose was 10 μCi for ^{14}C-labeled and 25 μCi for the ^{3}H-labeled bile acids. Blood samples were taken from the opposite antecubital vein to the point of injection at 2, 4, 6, 8, 10, 12, 15, 20, 30, 45, 60, 75, 90, 105, and 120 min after injection. The serum was separated and radioactivity was determined by liquid scintillation spectrometry. Subjects fasted throughout the experiment. Every primary bile acid, conjugated or unconjugated, had a biexponential plasma disappearance curve, indicating rapid disappearance. The half-life of the second component of the curve was about five times that of the first component, and they were highly correlated. The disappearance rates of cholylglycine and cholyltaurine were identical to each other, and were significantly faster than those of chenylglycine and chenyltaurine. For cholic and chenic acids, disappearance of the conjugated form was consistently faster than that of the unconjugated form. Dehydrocholyltaurine disappeared more slowly than any other acid; the half-life for the second exponential was 10 times that of the first. Cholic acid, conjugated or not, showed considerably less protein binding in the serum than unconjugated chenodeoxycholic acid, deoxycholic acid or chenodeoxycholic conjugates. Differences in fractions bound to serum protein of cholic acid (91.0%), cholylglycine (85.6%) and cholyltaurine (82.8%) were statistically significant. It is concluded that the primary bile acids, conjugated or unconjugated, rapidly disappear from plasma in a biexponential fashion.

5410 REDUCED BILE FLOW IN RATS DURING SULFOBROMOPHTHALEIN INFUSION. *(E.)* Schulze, P. J.; Czok, G. (Pharmacol. Inst., Univ. Hamburg, Germany). *Toxicol. Appl. Pharmacol.* 32(2):213-224, 1975.

Male urethane-anesthetized Wistar rats with biliary fistulas were infused i.v. with sulfobromophthalein (BSP), or BSP-glutathione conjugate (BSP-GSH) (594 nM/100 g/min) for 100 min. With BSP infusion, the bile flow increased for 25 min and subsequently fell almost linearly. Biliary excretion of BSP-GSH correlated with the bile flow, whereas the hepatic concentration of this metabolite rose during infusion. The concentration of unconjugated BSP also increased in the liver. On the other hand, the infusion of BSP-GSH resulted in a long-lasting choleresis accompanied by high biliary concentrations of BSP-GSH without a concurrent increase in the concentration of BSP-GSH in the liver. The data indicate that during infusion of BSP, the biliary excretion of BSP-GSH is impaired after a peak at 30 min, although its hepatic content rises continuously to 10 μM/100 g body weight or 2.63 μM/g of liver, resp., after 100 min of infusion. The decrease in excretion of BSP-GSH was not due to the limited transport capacity for this metabolite, as a much higher rate of excretion was observed during BSP-GSH infusion. It is concluded that with the infusion of BSP the impaired biliary excretion of BSP-GSH and its increase in the liver are due to the presence of unconjugated BSP in the liver. It is suggested that the conjugation with glutathione may be the rate-limiting step in the biliary excretion of BSP.

5411 PHENOBARBITOL-ENHANCED BILIARY EXCRETION OF ADMINISTERED UNCONJUGATED AND CONJUGATED SULFOBROMOPHTHALEIN (BSP) IN THE RAT. *(E.)* Whelan, G.; Combes, B. (Univ. Texas Southwest. Med. Sch., Dallas). *Biochem. Pharmacol.* 24(13/14):1283-1286, 1975.

The mechanism by which phenobarbitol enhances biliary excretion of sulfobromophthalein (BSP) was studied in Sprague-Dawley rats given sodium phenobarbitol s.c. daily for seven days (7.5 mg/100 mg). Twenty-four hr after the last injection, the common bile duct was cannulized and either unconjugated BSP or synthetic BSP-glutathione was given i.v. (18 μM or 30 μM, resp./100g). Bile was collected 10 min prior to BSP injection and for four consecutive 10 min periods. A blood sample was taken from the aorta at the end of this time, and the liver was removed and weighed. BSP concentration in the bile was determined by spectrophotometry. Bile was also analyzed by descending chromatography on filter paper. Phenobarbitol-treated rats had a marked increase in liver size. Maximum dye excretion in controls after injection of unconjugated BSP was 1.34 μM/100 g/10 min. Phenobarbitol pretreatment significantly raised this to 2.06 μM/100 g/10 min. The rise was accompanied by a bile flow increase from 0.057 to 0.106 ml/100 g/10 min. Phenobarbitol did not affect maximal BSP bile concentration. Chromatography showed 56.8% of the excreted dye was conjugated in the controls and 77.7% in the treated group. Unconjugated dye excretion was not affected. Maximal excretion rates of the conjugated form were higher in the treated group (4.10 μM/100 g/10 min) than in controls (2.71 μM/100 g/10 min). The treated group also showed a rise in bile volume from 0.073 to 0.088 ml/100 g/10 min before conjugated BSP injection. Biliary BSP concentration was higher in rats given conjugated than unconjugated BSP, and was comparable in treated and control rats given conjugated BSP. It is concluded that phenobarbitol enhances BSP excretion by increasing transport of the conjugated form from hepatocytes to bile, and by increasing the rate of its intrahepatic metabolism.

5412 THE ACCUMULATION OF ASPARTATE IN THE PRESENCE OF ETHANOL IN RAT LIVER. *(E.)* Stubbs, M.; Krebs, H. A. (Radcliffe Infirm., Oxford, England). *Biochem. J.* 150(1):41-45, 1975.

The ability of ethanol to cause accumulation of aspartate in rat liver in the presence of excess nitrogen was investigated. Hepatocytes from Wistar rats were isolated and put into suspension; in some cases the cytosolic and mitochondrial components were separated and labeled with markers. The cell suspension was analyzed for glucose, lactate, pyruvate, aspartate, glutamate, alanine, NH_4^+, urea, glutamine, malate, and 2-oxoglutarate content. Ethanol had no effect on aspartate yield in the suspension; it caused an increase in perfused liver. Of the total nitrogen, 17.5% appeared as NH_4^+ in suspension, as compared to 64% in perfused liver. Addition of 1.5 U/flask of urease to the hepatocyte suspension caused a 7-fold increase in aspartate formation on addition of ethanol, indicating that aspartate formation was dependent on NH_4^+ concentration. In the presence of 10 mM of lactate and 10 mM of NH_4Cl, ethanol caused a 22-fold increase in aspartate concentration, and inhibited glucose synthesis by 73%. Ethanol did not affect the amount of NH_4^+ removal, but increased the amount of NH_4^+ converted to aspartate and glutamate, and decreased the amount converted to urea. There was no increase in yields of aspartate and glutamate with or without ethanol, lactate or NH_4Cl. Addition of ornithine increased urea synthesis with or without the presence of ethanol, and abolished aspartate accumulation. It also depressed glucose synthesis from lactate and NH_4Cl, but ethanol partially overcame this depression. When the cells were fractionated, ethanol increased the aspartate yield 10-fold in the cytosol fraction, but did not affect the mitochondrial fraction. It also increased the glutamate content by 1.9 times and 3.7 times in these fractions, resp. The 2-oxoglutarate content was halved by ethanol in the cytosol, but was unaffected in the mitochondria. It is concluded that accumulation of aspartate in the presence of ethanol depends on high concentrations of NH_4^+.

5413 BIOCHEMICAL STUDIES ON THE EFFECT OF A DEPROTEINIZED BLOOD DERIVATIVE ON THE RECOVERY OF RAT LIVER AFTER HEMORRHAGIC SHOCK LASTING 60 MINUTES.

(Ger.) Wolff, R. (Steglitz Clin., Free Univ., Berlin, Germany). *Arzneim. Forsch.* 25(3):388-392, 1975.

The effect of Actihaemyl, a deproteinized extract of calf blood, was tested for its effect on hepatic anoxia caused by hemorrhagic shock. Ether-anesthetized male Wistar rats were bled until their average blood pressure had decreased to 40 mm Hg. After 60 min, their blood was retransfused along with Actihaemyl (5 ml/kg) or placebo (3.51% NaCl solution). Rats were sacrificed 30-120 min after retransfusion, and their livers were removed and homogenized. During shock significant increases occurred in lactate β-hydroxybutyrate contents with decreases in pyruvate values. Anoxia was characterized by an increase in the lactate/pyruvate ratio and a decrease in the ATP/ADP ratio. The glycogen content of the liver decreased to extremely low values. The concentrations of all metabolites studied, with the exception of ADP and acetoacetate, depended on the recovery time after hemorrhagic shock in both rats treated with Actihaemyl and in the controls. In treated rats lactate and β-hydroxybutyrate contents decreased more rapidly than in controls so that the lactate/pyruvate and β-hydroxybutyrate/acetoacetate ratios were decreased. These findings suggest that Actihaemyl increases O_2 uptake in the liver following hemorrhagic shock.

5414 THE EFFECT OF ALCOHOL ON LIPID METABOLISM IN THE ISOLATED PERFUSED RAT LIVER.

(Ger.) Ast, E.; Durr, C.; Bauer, E.; Papenberg, J. (Med. Clin., Univ. Heidelberg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:479-481, 1974.

The synthesis and secretion of lipoproteins were studied in the presence and absence of ethanol in isolated perfused livers from nonfasted rats. Livers were perfused for 4 hr with a medium containing 127 mM of oleic acid bound to albumin and 30 µCi of ^{14}C-leucine; 4 mM of ethanol were added at the beginning and an additional 3 mM were added 120 min later to experimental, but not to control, perfusates. In the presence of ethanol, secretion of total very low density lipoproteins (VLDL) into the medium increased significantly from 1099 to 1686 µg/g of liver, primarily due to increased triglyceride secretion. The specific activity of apoprotein in the VLDL fraction increased significantly from 122 to 247 cpm/µg in the presence of ethanol. Ethanol had no effect on low- or high-density lipoprotein fractions. Triglyceride concentrations in perfusion medium increased significantly from 2498 to 4203 µg/g of liver, and fatty acid concentrations increased from 2.43 to 3.52 mM/ml. The total lipid content of the liver decreased by 8.55 mg/g of liver in controls but increased significantly by 6.16 mg/g of liver in the presence of ethanol. Differences between the triglyceride and cholesterol contents of the liver were also significant, but no appreciable difference was observed for phospholipids. After 4 hr of perfusion, the fatty acid uptake of the liver was significantly lower in the presence of ethanol (34 mM/g) than in its absence (44 mM/g). Thus, these ethanol-induced changes in lipid metabolism are similar to ethanol-induced type IV hyperlipoproteinemia in man, which results mostly from increases in free fatty acids.

5415 SIMILARITY OF ARTERIAL AND INTRAVENOUS VASOPRESSIN ON PORTAL AND SYSTEMIC HEMODYNAMICS.

(E.) Barr, J. W.; Lakin, R. C.; Roesch, J. (Univ. Oregon Health Sci. Cent., Portland, Ore.). *Gastroenterology* 69(1):13-19, 1975.

The effects of superior mesenteric arterial and i.v. infusions of vasopressin and low- and high-dose i.v. infusions of vasopressin on splanchnic and systemic hemodynamics were compared in 20 anesthetized dogs. Injections of 5-10 g of microspheres into the portal circulation in five dogs of the first group (10 dogs) resulted in an immediate increase of portal pressure from a mean of 7.1 to 14.8 mm Hg. This level of increase lasted for 5-10 min after which portal pressure gradually fell and stabilized at a mean of 10.7 mm Hg. Comparison of selective arterial and i.v. infusions showed no statistically significant difference between the degree of changes in portal flow, portal and systemic blood pressure, and cardiac output. Only the superior mesenteric artery flow showed a greater decrease with the selective arterial injection. In the second group of 10 dogs, infusion of 14.0 mU/kg/min caused sharp falls in the superior mesenteric artery flow, portal vein flow and portal pressures, which reached their lowest levels in about 3-5 min. After the infusion, all parameters returned to normal levels, reaching the base line at the mean period of 55 min. Infusion of 2.75 mU/kg/min caused gradual decreases (about 10 min) and resulted in a maximal fall in superior mesenteric artery flow to 51% base line, in portal flow to 56% base line, and in portal pressures to 73% base line. The mean period of return to normal was 35 min. The applicability of these findings in dogs with normal or only slightly increased portal pressure to patients with liver disease and portal hypertension can only be established by clinical trials. The findings indicate that an easily applied i.v. infusion of vasopressin could again become the primary method for vasoconstrictive therapy of massive bleeding from varices.

5416 ACUTE LIVER INJURY BY VINYL CHLORIDE: INVOLVEMENT OF ENDOPLASMIC RETICULUM IN PHENOBARBITAL-PRETREATED RATS.

(E.) Reynolds, E. D.; Jaeger, R. J.; Murphy, S. D. (Peter Bent Brigham Hosp., Boston, Mass.). *Environ. Health Perspect.* 11:227-233, 1975.

An ultrastructural description of acute liver injury by vinyl chloride in male Holtzman rats pretreated with phenobarbital is presented. Daily consumption of phenobarbital was approximately 10 mg/100 g rat. Treated and nontreated rats were exposed to 5% vinyl chloride for 6 hr once or to 5% vinyl chloride for 6 hr each on five consecutive days. Twenty-four hr after the onset of a single exposure of 5% vinyl chloride, there was diffuse vacuolization of the cytoplasm of centrilobular liver parenchyma and focal areas of necrosis of midzonal parenchyma in phenobarbital-pretreated rats. Vacuolization involved approximately two-thirds of the hepatic parenchyma, and midzonal necrosis was focal throughout most of the liver and became extensive and confluent toward the dorsal aspect. In contrast, livers of animals exposed to vinyl chloride without phenobarbital pretreatment appeared normal. Livers of phenobarbital-pretreated animals exposed to 5% vinyl chloride on five consecutive days contained broad tracts of stroma depleted of parenchymal cells which correspond in distribution and extent to the areas of necrosis seen at 24 hr. Vacuolated liver parenchymal cells in phenobarbital-pretreated rats killed 24 hr after the onset of exposure to 5% vinyl chloride revealed extensive dilation of the cysternae of the rough endoplasmic reticulum and coalescence of the smooth into discrete aggregates of smooth surfaced tubules conspicuously flecked with areas of increased electron opacity. The ultrastructural observations that the acute liver lesion produced by vinyl chloride primarily involves components of the endoplasmic reticulum, coupled with the fact that phenobarbital enhances injury, suggest that this organelle is the primary site of generation of toxic metabolites from vinyl chloride.

5417 ALPHA FETOPROTEIN: EFFECT OF HETEROLOGOUS ANTISERUM ON HEPATOMA CELLS IN VITRO. *(E.)* Mizejewski, G. J.; Young, S. R.; Allen, R. P. (Div. Lab. Res., New York State Dep. Health, Albany). *J. Natl. Cancer Inst.* 54(6):1361-1367, 1975.

The cytotoxic effect of rabbit antisera against mouse alpha-fetoprotein (AFP) on mouse hepatoma cells was studied. Mouse BW7756 hepatoma cells and C57L/J muscle fibroblasts were grown in culture to near confluency, washed, and grown in Eagle's minimum essential medium-Hanks' balanced salt solution containing either 4% immunized (anti-AFP) or 4% nonimmunized rabbit serum. Cytotoxic antibody assays were also carried out on fresh tumor cell suspensions. The BW7756 cells synthesized AFP *in vitro*, the AFP being immunologically identical to that circulating in the sera of hepatoma-bearing mice. In the cytotoxicity assays, the presence of intact and/or inactivated anti-AFP serum inhibited the growth of the AFP-producing cells. The cytotoxic effects of the antiserum depended on both exposure time and serum concentration. The cytotoxicity was complement independent, as demonstrated by studies with heat-deactivated serum devoid of extrinsic complement. Specificity of the antisera for the target cells was demonstrated by absorption with purified mouse AFP. The results could be explained by the postulated presence of AFP on the hepatoma cell surface.

5418 INFLUENCE OF SUBTOTAL HEPATECTOMY ON PEROXISOMES AND PEROXISOMAL ENZYMES OF RAT LIVER AND ISOLATED LIVER CELL FRACTIONS. *(E.)* Goldenberg, H.; Heuttinger, M.; Boeck, P.; Kramar, R. (Dep. Med. Chem., Univ. Vienna, Austria). *Histochemistry* 44(1):44-47, 1975.

The influence of subtotal hepatectomy on peroxisomes and peroxisomal enzymes of rat liver and isolated liver cell fractions was investigated in Sprague-Dawley rats. The activities of peroxisomal enzymes were followed one to ten days after subtotal (60-70%) hepatectomy in homogenates prepared from regenerating livers and in cell fractions isolated from them. Catalase activity was depressed in the total liver homogenate as well as in the mitrochondrial and soluble fractions; it did not change appreciably in the microsomal and lysomal fractions. α-Hydroxyacid oxidase behaved in a similar fashion. In contrast to these enzymes, urate oxidase activity remained unchanged in total liver homogenate, whereas it decreased in mitrochondrial and increased in lysosomal fractions and microsomal fractions during the first five days after operation. These results agree well with the assumption that microbody proliferation is initiated by the fragmentation of large peroxisomes. Biochemical examinations were paralleled by morphological and histochemical studies. The number of peroxisomes increased during the first day after partial hepatectomy, and this was accompanied by a decrease in particle size. During the first mitotic wave (24-36 hr postoperative), the number of peroxisomes/cell was reduced by about half. After this time, the number and size of the particles began to increase. Positive staining of ribosomes was frequently observed in the vicinity of peroxisomes after the application of the cytochemical catalase reaction (alkaline diaminobenzidine medium). This phenomenon is interpreted to represent a diffusion artifact rather than the cytochemical identification of newly synthesized catalase.

5419 INFLUENCE OF PHOSPHOLIPIDS ON LIVER DAMAGE. I. CARBON TETRACHLORIDE POISONING AND ALTERATIONS IN AMINO ACID UPTAKE, PEROXIDATION, SIALIC ACID CONTENT, AND LYSOSOMAL ENZYMES. *(E.)* Gerber, G. B.; Bartsch, G. G.; Deroo, J. (Dep. Radiat. Biol., d'Centre Etude Nucleaire, Mol, Belgium). *Acta Hepatogastroenterol. (Stuttg.)* 22(3):175-180, 1975.

Changes in peroxidation, amino acid uptake [α-amino isobutyrate], sialic acid content and lysosomal enzymes were investigated in male Wistar rats and male BALB/c$^+$ mice after carbon tetrachloride poisoning and treatment with phospholipids. The animals received 1 ml of a 10% phospholipid suspension for 7 days prior to administration of CCl_4 by stomach tube. The labeled α-amino isobutyrate (1 μCi) was injected i.p. 1 hr or 18 hr before sacrifice. CCl_4 was given 6 or 24 hr before sacrifice. Homogenates were made of liver, muscle, heart and brain tissue. The uptake and retention of α-amino isobutyrate in liver increased markedly during CCl_4 poisoning. Phospholipids did not alleviate this effect and seemed to delay release of α-amino butyrate by liver. In CCl_4 poisoned rats, the uptake of α-amino butyrate was diminished in the heart but enhanced in the brain. No changes were seen in muscle. Total sialic acid in liver increased 24 hr after administration of CCl_4. Free sialic acid increased slightly in liver of CCl_4 treated rats and decreased in the brain of CCl_4 and phospholipid treated animals. Peroxides and peroxide formation were determined by the thiobarbituric acid reaction. Preformed peroxides were not affected by CCl_4 poisoning but they were diminished by phospholipid treatment. Peroxide formation was significantly greater in rats not receiving phospholipids and was markedly increased 24 hr after CCl_4 poisoning. More preformed peroxides were present in mouse than in rat liver. Peroxide formation was enhanced in mouse liver poisoned with CCl_4, but protection with phospholipids had little effect. Lysosomal enzymes were slightly influenced by phospholipid treatment and/or CCl_4 poisoning, except for a slight increase in free catheptic activity in CCl_4 poisoned mouse liver. The observed increase in catalytic peroxide formation, as well as the higher levels of peroxides in poisoned mouse liver early after intoxication, suggests that peroxides participate in the hepatotoxicity of CCl_4. Peroxidation appears to be the primary symptom of CCl_4 intoxication, with change in protein synthesis only a secondary effect.

5420 THE RELATION BETWEEN LIVER CIRCULATION AND LIVER FUNCTION: ITS CLINICAL RELEVANCE. *(Ger.)* Preisig, R. (Inst. Clin. Pharmacol., Univ. Bern. Switzerland). *Z. Gastroenterol.* 13(suppl.):104-112, 1975.

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5424 SODIUM GLYCO-24,25-DIHYDROFUSIDATE. BILIARY EXCRETION AND EFFECT ON BILE LIPID SECRETION IN THE RAT. *(Fr.)* Montet, J. C.; Montet, A. M.; Amic, J.; Hauton, J. C. (Res. Group Lipid Transport, Marseille, France). *Biol. Gastroenterol. (Paris)* 7(4):326, 1974.

5425 ROLE OF BILE AND PANCREATIC SECRETIONS IN MUCOSAL GROWTH AFTER JEJUNECTOMY IN RATS FED CHOW OR PREDIGESTED DIET. *(E.)* Weser, E.; Tawil, T. (Univ. Texas Health Sci. Cent., San Antonio, Tex.). *Gastroenterology* 68(4):1012, 1975.

5426 EFFECT OF THYROID FUNCTION ON THE ELECTROPHORETIC PATTERN OF MITOCHONDRIAL PROTEINS IN RAT LIVER. *(Fr.)* Baudry, M.; Clot, J. P.; Michel, R. (Teach. Res. Unit Pharm. Sci. Biol., Paris, France). *Biochimie* 57(1):77-83, 1975.

5427 NUCLEIC ACIDS IN THE CEREBRAL CORTEX AND LIVER FOLLOWING ISOLATED COMPLETE ANOXIA OF THE CENTRAL NERVOUS SYSTEM. *(Rus.)* Kozhura, V. L. (Lab. Exp. Physiol. Resuscitation, Moscow, USSR). *Biull. Eksp. Biol. Med.* 79(2):34-35, 1975.

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5434 MECHANISMS INVOLVED IN BILE SECRETION IN MAN. *(Ger.)* Kuska, J. (Silesian Acad. Med., Katowice, Poland). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(2-4):145-150, 1974.

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5534 INCREASE IN SERUM ALPHA FOETOPROTEIN LEVEL IN HEPATIC REGENERATION OF THE RAT. EFFECTS OF AGE AND OF MAGNITUDE OF REGENERATIVE ACTIVITY. *(E.)* Nayak, N. C.; Mital, I.; Dhar, A.; Chopra, P.; Das, P. K. (All India Inst. Med. Sci., New Delhi). *Br. J. Exp. Pathol.* 56(2):56, 113-118, 1975.

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5536 CHOLESTEROL FATTY LIVER: MORPHOLOGICAL CHANGES IN THE COURSE OF ITS DEVELOPMENT IN RABBITS. *(E.)* Lee, S. S.; Ho, K. J. (Univ. Alabama Med. Cent., Birmingham). *Arch. Pathol.* 99(6):301-306, 1975.

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5552 IDENTIFICATION AND QUANTITATION OF CHOLANOIC ACIDS IN HEPATIC AND EXTRA-HEPATIC TISSUES OF RAT. *(E.)* Oh, S. Y.; Dupont, J. (Dep. Food Sci. Nutr., Colorado State Univ., Fort Collins). *Lipids* 10(6):340-347, 1975.

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5555 CYCLIC ADENOSINE 3':5'-MONOPHOSPHATE AND THE INDUCTION OF DEOXYRIBONUCLEIC ACID SYNTHESIS IN LIVER. *(E.)* Short, J.; Tsukada, K.; Rudert, W. A.; Lieberman, I. (VA Hosp., Pittsburgh, Pa.). *J. Biol. Chem.* 250(10):3602-3606, 1975.

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5559 ULTRASTRUCTURAL EVOLUTION OF EXPERIMENTALLY INDUCED LIPID INCLUSIONS IN RAT AND MOUSE HEPATOCYTES INDICATIVE FOR THE RECOVERY OF LIVERS FROM EFFECTS OF BENZIDAMINE AND TRIACETYLOLEANDOMYCIN. *(E.)* Garaci, E.; Djaczenko, W. (Inst. Microbiol., Univ. Rome, Italy). *Ann. Sclavo.* 16(1):18-28, 1974.

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See also, 5210, 5218, 5294, 5297, 6096, 6133, 6153, 6194, 6345.

SECRETION AND METABOLISM

Intestine

5561 ENZYME-HISTOCHEMICAL AND ELECTRON MICROSCOPE STUDIES OF THE CIRCADIAN RHYTHM IN RAT INTESTINAL MUCOSA. *(Ger.)* Schafer, V. A.; Hohn, P.; Mika, H.; Allbach, G. (Inst. Pathol., Johannes Gutenburg Univ., Mainz, Germany). *Acta Histochem. (Jena)* 48(2):301-319, 1974.

Circadian rhythms of the small intestine were studied in Sprague-Dawley rats which were screened from outside disturbances. The animals were divided into six groups of seven rats each, and sections of the bowel were removed at six fixed points at the following times of the day: 20, 24, 4, 8, 12, and 16 hr. The bowel sections were removed from locations ranging from the duodenum, jejunum and ileum to the start of the ascending colon. Enzyme functions were evaluated by electron microscopy and histochemistry (alkaline phosphatase, acid phosphatase, glucose-6-phosphatase, nucleotidase, ATP, leucinaminopeptidase, LDH, succinodehydrogenase, monoaminooxidase, and glucose-6-phosphatedehydrogenase). The hydrolases in particular showed clear-cut fluctuations of activity. In most cases the values in the afternoon and night hours were significantly higher than in the early morning and day time hours. The findings with the dehydrogenases were less uniform. G-6PDH and MAO showed relatively small differences of activity at various times of the day, whereas SDH showed a maximum at 8 hr and LDH a peak at 8 hr and 24 hr. The data presented are in agreement with the concept of the existence of circadian fluctuations of activity in the intestinal mucosa which in a general sense are an expression of the nocturnal activity of the rat.

5562 LYSOSOMAL CHANGES IN THE GUT OF RATS AFTER CHRONIC TREATMENT WITH PHENOBARBITAL. *(E.)*

Rivera-Calimlim, L.; Bosmann, H. B.; Penney, D. P.; Lasagna, L. (Univ. Rochester Sch. Med. Dent., N.Y.). *Biochem. Pharmacol.* 24(11-12):1161-1166, 1975.

The effect of long-term oral phenobarbital administration on the lysosomal enzyme activity of the intestine was studied in male Sprague-Dawley rats. Phenobarbital in distilled water solution (100 mg/kg/day) was administered by intragastric tube for 8 weeks. Matched controls were treated with distilled water. The intestinal transport of ^{14}C-methionine and ^{14}C-D-xylose in everted jejunal sacs, the ultrastructure of the jejunum, and the lysosomal enzyme activity of the jejunum were subsequently studied. Significant increases in the lysosomal enzyme activities in the intestine were observed 1 and 2 months after the beginning of phenobarbital treatment. As early as 1 month after the commencement of treatment, the activities of α-glucosidase, β-galactosidase, β-*N*-acetyl-galactosaminidase, β-*N*-acetyl-glucosaminidase, β-xylosidase, and acid phosphatase were increased, as were cathepsin-like and trypsin-like activities; the activities of α-mannosidase and α-fucosidase increased only after 2 months of treatment. Ultrastructural changes in the jejunum of the drug-treated rats were also observed; these included increased agranular endoplasmic reticulum and ribosomal particles and increases in the acid-phosphatase-positive dense bodies and coated vesicles in the absorptive cells of the intestine. There were no gross morphological changes in the intestine and there were no major alterations in the morphology of the goblet cells or in the mitochondria, terminal web, microvillus projections, Golgi apparatus, or nuclei of the absorptive cells. In addition, the mucosal transport of ^{14}C-methionine and ^{14}C-D-xylose was not altered. Thus, chronic administration of phenobarbital causes biochemical and morphological changes in the intestine; this dose level corresponds to a dose of about 600 mg in man, which is within the daily dose range administered to human patients.

5563 REGIONAL AND CELLULAR LOCALIZATION OF GLYCOSYLTRANSFERASES IN RAT SMALL INTESTINE: CHANGES IN ENZYMES WITH DIFFERENTIATION OF INTESTINAL EPITHELIAL CELLS. *(E.)*

Kim, Y. S.; Perdomo, J.; Ochoa, P.; Isaacs, R. A. (Veteran's Admin. Hosp., San Francisco, Calif.). *Biochim. Biophys. Acta* 391(1):39-50, 1975.

Optimal assay conditions were determined for four glycosyltransferases in rat small intestinal mucosal homogenates and the regional distribution and cellular localization of these enzymes was studied. Samples of jejunum and ileum were prepared from male Wistar rats, homogenized and incubated with a mixture containing Fetuin II or Fetuin I acceptor, buffer, $MnCl_2$, ATP, UDPglucose, UDP(U-^{14}C)galactose or CMP-N-acetyl(4,5,6,7,8,9-^{14}C)-neuraminic acid, Triton X-100, and enzyme. For each glycosyltransferase, similar levels of activity were found in duodenal, proximal jejunal, and distal ileal segments; the activities of the galactosyltransferases being lower in the distal jejunal-proximal ileal segments. Planar section studies indicated that undifferentiated crypt cells had significantly higher levels of sialyltransferase activities of the jejunum and ileum than the mature villous cells. A similar crypt-to-villous gradient was found for a galactosyltransferase in the ileum. Requirements for the galactosyltransferase assay included Mn^{2+}, Triton X-100, UDPglucose, and acceptor, while the sialyltransferase activity required Triton X-100 and acceptor. With Fetuin II as acceptor, the optimal conditions for the assay of the two galactosyltransferases were pH 6.0, 45 C, and 10 mM Mn^{2+}; with ovine submaxillary mucin as acceptor, the optimum assay conditions were pH 7.0, 37 C, and 40 mM $MnCl_2$. For the sialyltransferase assays, pH 6.1 and 30 C were optimal. The results suggest that the glycoprotein synthesis may be active on the undifferentiated crypt cells and that certain glycosyltransferases may serve as marker enzymes for cellular differentiation in the intestine.

5564 OCCURRENCE OF H_2-RECEPTORS FOR HISTAMINE IN THE GUINEA-PIG INTESTINE. *(E.)*

Bareicha, I.; Rocha E Silva, M. (Fac. Med., Sao Paulo, Brazil). *Biochem. Pharmacol.* 24(11-12):1215-1219, 1975.

The specific anti H_2 agent, burimamide, was used to analyze the stimulatory effects of histamine on the isolated guinea-pig ileum, and the proportion of H_2/H_1 receptors was calculated by the application of Clark's equation to data obtained in the presence and absence of burimamide. Isolated strips of guinea-pig ileum and duodenum were perfused with medium containing 10^{-7} M atropine; dose-response curves were obtained by adding (in triplicate or quadruplicate) increasing doses of histamine in the absence (control) and presence of 10^{-6} M burimamide. Burimamide potentiated the stimulatory effect of histamine on the guinea-pig ileum, an effect which was attributed to the relaxing effect induced by H_2-receptors present in the preparation. Similar results were obtained with pieces of guinea-pig duodenum. On the basis of Clark's equation, the proportion of H_2/H_1 receptors in the ileum was calculated to be 15.7%, while the average value for the duodenum was 12.4%. This small percentage of H_2/H_1 receptors may account for the fact that only the smallest concentrations of histamine appeared to be potentiated by burimamide and that this effect tended to disappear as the concentrations of histamine approached those giving maximal contraction.

5565 STUDIES ON THE BRUSH BORDER MEMBRANE OF THE MOUSE DUODENUM. I. MEMBRANE ISOLATION AND ANALYSIS OF PROTEIN COMPONENTS. *(E.)*

Billington, T.; Nayudu, P. R. V. (Dep. Zool., Monash Univ., Victoria, Australia). *J. Membr. Biol.* 21(1-2):49-64, 1975.

The proteins, carbohydrates and lipids of the brush border membrane of the mouse duodenum were analyzed using duodenal segments from adult Swiss mice. Brush border membranes were isolated from the villus epithelial cells of the segments, solubilized in Tris-sodium dodecyl sulfate buffer, and analyzed by sodium dodecyl sulfate-polyacrylamide gel electrophoresis. Preparations of these membranes were not contaminated by other organelles as judged from electron micrographs of sectioned brush-border pellets. Electrophoresis of the brush border proteins revealed a reproducible Coomassie Brilliant Blue pattern of 17 bands. By comparing the brush border protein band positions with those of standard proteins run concurrently on sodium dodecyl sulfate-polyacrylamide gel slabs, it was estimated that the 17 proteins and subunits had molecular weights ranging from over 250,000 to around 16,000 daltons. Periodate-fuchsin sulfite staining showed that the five slowly migrating, high molecular weight proteins were glycoproteins. The two proteins of smallest molecular size reacted positively with Oil Red O but had very small amounts of lipophilic amino acid residues, indicating that the lipid extractable from the gels in these areas was a contaminant and not bound to the proteins.

5566 EFFECT OF STASIS ON INTESTINAL ENZYME ACTIVITIES. *(E.)* Gracey, M.; Thomas, J.; Houghton, M. (Princess Margaret Child. Med. Res. Found., Perth, Western Australia). *Aust. N.Z. J. Med.* 5(2):141-144, 1975.

The intestinal mucosal activities of lactase, sucrase, maltase, alkaline phosphatase, and N-acetyl-β-glucosaminidase were studied in rats with surgically-induced upper intestinal stasis. Upper jejunal blind loops were made in adult Wistar rats. After 4-8 weeks tissue specimens were taken from the blind loop, the jejunum 5 cm proximal to the junction with the loop, and the jejunum 5 cm distal to the loop; specimens were also taken from the duodenojejunal junction in normal control rats. Activities of the three disaccharidases were significantly reduced in all three anatomical regions studied, but the reduction was more marked in the blind loop specimens than in those from the proximal or distal jejunum. Activities of alkaline phosphatase and N-acetyl-β-glucosaminidase were also significantly reduced in the distal gut and blind loop tissues; in addition, alkaline phosphatase was significantly reduced in the proximal gut. The results suggest a causal relation between the degree of overgrowth of the small intestinal microflora, the extent of bile salt deconjugation, and the degree of mucosal damage in the blind-loop animals; they also suggest that there was a considerable degree of damage to the lysosymes in this experimental model. The pathogenetic significance of these findings in relation to the "contaminated small-bowel syndrome" in man is unclear, but they suggest that there is an important and previously ignored mucosal lesion in this syndrome.

5567 LOCALIZATION OF SUBSTANCE P-LIKE IMMUNOREACTIVITY IN MOUSE GUT. *(E.)* Nilsson, G.; Larsson, L. I.; Hakanson, R.; Brodin, E.; Pernow, B.; Sundler, F. (Dep. Pharmacol., Karolinska Inst., Stockholm, Sweden). *Histochemistry* 43(1):97-99, 1975.

Specific antibodies against synthetic substance P were used to localize this peptide in the mouse intestine. Sectioned duodenal and proximal colonic specimens from female mice were treated with substance P antiserum and examined under the fluorescence microscope using the indirect immunofluorescence method. Strong immunofluorescence was observed in numerous nerve fibers of the myenteric plexus in the colon but not in the duodenum. The immunofluorescent nerve fibers encircled the ganglionic cells, which were nonfluorescent, and extended from the plexus in between bundles of smooth muscle. Immunofluorescence was also observed in scattered epithelial cells in the mucosa of both colon and duodenum, their numbers being much greater in the latter than the former. The immunoreactivity of these endocrine-like cells was of lower intensity than that of the nerve fibers of the myenteric plexus. In number, shape, and distribution, the immunoreactive mucosal cells resembled the enterochromaffin cells. Thus, substance P-like immunoreactivity occurs in the myenteric plexus of the proximal colon and in epithelial, possible endocrine, cells of the mucosa.

5568 LOCALIZATION OF THE MONOGLYCERIDE PATHWAY ENZYMES IN THE VILLUS TIPS OF INTESTINAL CELLS AND THEIR ABSENCE FROM THE BRUSH-BORDER. *(E.)* Negrel, R.; Ailhaud, G. (Cent. Biochim., Univ. Nice, France). *FEBS Lett.* 54(2):183-188, 1975.

The localization of monoglyceride pathway enzymes within the intestinal epithelial cells of the rat and pig was studied. Intestinal epithelial cells were fractionated, and purified brush-border vesicles were prepared. Aminopeptidase, alkaline phosphatase, cytochrome c oxidase, NADPH-cytochrome c reductase, Acyl-coenzyme A (CoA):monoglyceride and diglyceride acyltransferases, Na$^+$, K$^+$-ATPase ouabain sensitive activity, inorganic P, and N-acetylglucosaminyltransferase were assayed. Acyl-Coa:monoglyceride acyltransferase was localized in the villus tips of both the rat and pig intestinal cells. The acyl-CoA:diglyceride acyltransferase showed a similar pattern, with a ratio of mono:diglyceride acyltransferase equal to 1:3. Sucrose density gradient analysis and precipitation of the brush-border membrane vesicles by aminopeptidase antibodies indicated that the acyl-CoA:monoglyceride acyltransferase was not present in the brush-border fraction. The small amount of enzyme activity responsible for the monoglyceride esterification in the brush-border fraction is due to contamination by membranous structures. The results demonstrate that the acyl-CoA:monoglyceride acyltransferase (as well as the acyl-Coa:diglyceride acyltransferase), the specific marker of the monoglyceride pathway, can be used as a marker of differentiation for intestinal cells. The membranous structures to which the monoglyceride acyltransferase is attached may be some smooth endoplasmic reticulum in continuity with the cytoplasmic membrane.

5569 EFFECT OF ACUTE DIETARY ALTERATION UPON INTESTINAL LIPID SYNTHESIS. *(E.)* Mansbach, C. M., II. (VA Hosp., Durham, N.C.). *Lipids* 10(6):318-321, 1975.

The specific activities of 3 enzymes engaged in complex lipid synthesis, diglyceride acyltransferase, cholinephosphotransferase, and lysolecithin acyltransferase, were studied in intestinal mucosa of hamsters fed 2 meals of either saline, hydrolyzed casein, or corn oil in a 5.5-hr period. The animals were sacrificed 4 hr later and the small intestine divided into 4 equal segments; the mucosa of each segment was scraped to yield villous tip and crypt preparations, from which low-speed supernatant and microsomal fractions were derived. Enzyme assays, thin layer chromatography, and protein and radioactivity determinations were made. In the most proximal intestine, saline feeding was associated with reduced specific activities of all 3 enzymes in villous tips when compared with the 2 calorie-supplemented groups. In the most distal intestine, oil feeding increased the activity of lysolecithin acyltransferase and cholinephosphotransferase 2-fold as compared to casein-fed hamsters; diglyceride acyltransferase was increased 1.5-fold. The response of lysolecithin acyltransferase and diglyceride acyltransferase to fat feeding was incomplete when compared to hamsters fed a fat-supplemented diet for 7 days, suggesting that their pattern of response to fat was similar to sucrase response to sucrose feeding. By contrast, the response of cholinephosphotransferase to fat feeding was complete at 24 hr, suggesting that it responds in a manner similar to the glycolytic enzymes.

5570 THE "FAT RAT": A NEW EXPERIMENTAL JEJUNOILEAL BYPASS MODEL. *(E.)* Madura, J. A.; Csicsko, J. F.; Cooney, D. R.; Grosfeld, J. L. (Indiana Univ. Sch. Med., Indianapolis). *J. Pediatr. Surg.* 10(3):349-352, 1975.

Morphologic and metabolic alterations induced by jejunoileal bypass were studied in a unique obese experimental animal referred to as the "fat rat". A 90% jejunoileal bypass was performed in 20 genetically obese Zucker fat rats (500-600 g) and 20 Sprague-Dawley rats (350-400 g). Twenty unoperated growing rats of each strain served as controls. All of the animals were evaluated daily for weight loss, postoperative complications, and survival. At the end of 40 days, the animals were sacrificed and liver sections were evaluated microscopically. All rats with a jejunoileal bypass lost weight; the most rapid loss occurred during the 1st postoperative week. At 40 days, the mean weight loss for the 19 surviving operated Sprague-Dawley rats was 50 g; the controls had a mean weight gain of 35 g. The 16 surviving operated fat rats had a weight loss of 175 g while the 20 controls had a gain of 80 g. Minimal fatty infiltration of the liver was seen in 1 of 20 Sprague-Dawley controls; minimal to moderate fatty infiltration was observed in all fat rat controls. Moderate fatty infiltration was observed in the operated Sprague-Dawley rats, but operated fat rats consistently demonstrated moderate to severe fatty infiltration of the liver. The data suggest that the fat rat is a valuable laboratory model for studying morbid obesity and the aftereffects of jejunoileal bypass.

5571 EFFECTS OF PHARMACOLOGIC SYMPATHECTOMY ON GUT HYPERTROPHY IN ENTERECTOMIZED RATS. *(E.)* Touloukian, R. J.; Tilson, M. D.; Roth, R. (Yale Univ. Sch. Med., New Haven, Conn.). *J. Surg. Res.* 19(1):9-11, 1975.

The effects of 6-hydroxydopamine-induced sympathectomy on the compensatory hypertrophy seen in the jejunal and ileal remnants following enterectomy were studied in rats to further define the relation between adrenergic innervation and gut hypertrophy. 6-Hydroxydopamine (75 mg/kg) was injected i.v. into male Sprague-Dawley rats; the injection was repeated after 7 days. One week after the second injection, the sympathectomized animals and a group of normal animals underwent 50% mid-enterectomy. The jejunal and ileal remnants were examined 2 months later and the villus length measured. An 80% reduction in the catecholamine concentration of the jejunum and ileum was observed 1 week and 1-2 months after 6-hydroxydopamine treatment. This treatment had no effect on the growth rate of the animals or villus height of the jejunal or ileal remnants after enterectomy. These data do not support the hypothesis that adrenergic innervation initiates or accelerates hypertrophy in the gut remnant.

5572 EFFECT OF BILE ACIDS ON ELECTRICAL PROPERTIES OF RAT COLON: EVALUATION OF AN IN-VITRO MODEL FOR SECRETION. *(E.)* Schwiter, E. J.; Hepner, G. W.; Rose, R. C. (Pennsylvania State Univ. Coll. Med., Hershey). *Gut* 16(6):477-481, 1975.

Changes in the short-circuit current and transmural electrical potential difference (pd) of the rat colon were measured as an index of the state of secretory activity of the tissue following bile acid administration. The serosa and part of the musculature were removed from proximal colonic segments taken from male Sprague-Dawley rats. The remaining tissue was incubated in Ringer solution containing bile acid (2 mM) and/or theophylline (10 mM). The short-circuit current and pd were measured before and after the addition of bile acid and theophylline. Applied to the serosal and mucosal surfaces or to the serosal surface alone, taurochenodeoxycholic acid increased the short-circuit current and pd within 2 min; this acid was without effect when applied to the mucosal surface alone. Taurochenodeoxycholic acid also produced a significant decrease in tissue resistance. When this acid was added to the mucosal and/or serosal solution after the addition of theophylline, there was no increase in short-circuit current. Taurocholic acid also increased short-circuit current and pd when applied to serosal and mucosal surfaces or the serosal surface alone; however, the taurocholic acid-induced increase in the short-circuit current following serosal application was significantly less than that seen with taurochenodeoxycholic acid. Theophylline increased the short-circuit current and pd when applied to the serosal and/or mucosal surface. Theophylline had no significant effect on either parameter when added after the serosal application of taurochenodeoxycholic acid, although it had a stimulatory effect when added after the mucosal application of this acid; pretreatment with taurocholic acid at either surface slightly reduced the effect of theophylline. In that these results are inconsistent with results obtained *in vivo*, it is concluded that this *in vitro* model has limitations for studying the mechanism of bile acid-stimulated intestinal secretion.

5573 EFFECTS OF DIETS CONTAINING DRIED WHEY ON THE LACTASE ACTIVITY OF THE SMALL INTESTINAL MUCOSA AND THE CONTENTS OF THE SMALL INTESTINE AND CECUM OF THE PIG. *(E.)* Ekstrom, K. E.; Benevenga, N. J.; Grummer, R. H. (Coll. Agricultural Life Sciences, Univ. Wisconsin, Madison, Wis. 53706). *J. Nutr.* 105(7):851-860, 1975.

The effects of long-term feeding of various levels of dried whey on the mucosal lactase-specific activities of several genetic groups of pigs were studied. Additional experiments investigated the effect of feeding a high level of lactose on the total lactase activities of intestinal mucosa and contents, as well as the distributional pattern of these activities along the intestinal tract of two breeds of swine. Feeding 0, 10, 25 or 40% dried whey in the first study did not alter the mucosal lactase-specific activity. Assay of duodenal lactase, for example, showed 0.16 μM of galactose released/mg of protein/hr in controls, compared to values of 0.22, 0.18 and 0.18, resp., for the 10%, 25% and 40% whey diets, resp. There was no significant difference between breeding groups or breed-treatment interactions. The types of breeds used were not specified. In the second study, lactase activity in the small intestine was estimated in the total activity found in 10-cm segments of each meter of intestine. Feeding a diet containing 40% whey continuously from weaning (age 5 weeks) or from age 12 weeks did not alter the total lactase activity in pigs killed at age 21 weeks. Dietary lactose tended to increase lactase activity in cecal and small intestinal contents, but the increases were not always statistically significant. Chester White pigs had approximately 3-fold greater mucosal lactase activities (815 g of lactose able to be hydrolyzed in 24 hr) than those of Hampshire pigs (268 g). It is suggested that these two breeds may be suitable models to study the relations between lactase deficiency and lactose intolerance. Further, these results indicate that the level of mucosal lactase activity of the pig small intestine is not altered by dietary lactose.

5574 RELEASE OF CHOLECYSTOKININ BY ACID. *(E.)* Barbezat, G. O.; Grossman, M. I. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Proc. Soc. Exp. Biol. Med.* 148(2):463-467, 1975.

The amount of cholecystokinin (CCK) released by acid was estimated *in vivo* in mongrel dogs prepared with chronic pancreatic fistulas and Thomas cannulas in the dependent portion of the stomach. Porcine secretin (1300 ng/kg/hr) was given by continuous i.v. infusion and the pancreatic secretion was allowed to reach a steady level before the infusion of HCl (or 0.15 M NaCl to controls) and phenol red into the duodenum. In some cases, additional secretin or 10% porcine CCK was given in place of the duodenal infusion. In other experiments, the pancreas was stimulated for 2 hr by: continuous duodenal perfusion with 0.16 M HCl at 12.5, 25, 50, 100, or 200 ml/hr; continuous i.v. infusion of synthetic secretin at 62.5, 125, 250, or 500 ng/kg-hr; or continuous i.v. infusion of a fixed ratio combination of synthetic secretin and CCK. The volume, bicarbonate, and protein concentrations of the pancreatic juice were measured. Duodenal infusion of 16 nM/hr of HCl with a high background dose of i.v. secretin stimulated pancreatic protein secretion to about the same extent as did 0.5 u/kg-hr of exogenous CCK. The same acid load without the secretin background gave a response equivalent to about 0.7 u/kg-hr of CCK. Thus, expressed as fractions of their respective doses for half maximal response, acid releases almost five times more secretin than CCK.

5575 PROPERTIES OF GUANYLATE CYCLASE AND LEVELS OF CYCLIC GMP IN RAT SMALL INTESTINAL VILLOUS AND CRYPT CELLS. *(E.)* De Jonge, H. R. (Fac. Med., Erasmus Univ. Rotterdam, The Netherlands). *FEBS Lett.* 55(1):143-152, 1975.

The characteristics of brush border-localized guanylate cyclase were compared with those of microsomal enzyme preparations from isolated villous and crypt cells. A variety of hormones and hormone-like substances reported to raise cyclic AMP levels in the rat small intestine, to elevate cyclic GMP in other tissues, or to affect intestinal transport functions were tested for their ability to alter the intestinal guanylate cyclase activity *in vitro* or to regulate cyclic GMP levels in isolated villous and crypt cells and in mucosal scrapings. The kinetic properties of the brush border-bound guanylate cyclase included a positive co-operative behavior indicating multiple binding sites for $MnGTP^{2-}$ and independence from free Mn^{2+} at saturating $MnGTP^{2-}$ concentrations. The kinetic patterns of the particulate gunaylate cyclase from the upper villous cell microsomes, on the other hand, showed a marked loss of co-operativity with respect to $MnGTP^{2-}$ and activation by free Mn^{2+} at high $MnGTP^{2-}$ levels. Guanylate cyclase from the crypt microsomes displayed an intermediate type of kinetic behavior. Incubation with the brushborder guanylate in the presence of 0.1% Triton X-100 gave a 2-fold rise in activity, while 1.4 mM of $CaCl_2$ slightly inhibited the enzyme at 0.3 mM Mn^{2+}free but stimulated it by 1.2-fold at 4 mM Mn^{2+}free. Strong inhibitory effects were found with PEP, oxaloacetate, and ATP or ADP. Alloxan had a slightly inhibitory effect, amino acids in physiological concentrations had a small stimulatory effect, and D-isomers were ineffective, as were NaF, glucose, choleragen, prostaglandins E_1, F_2 and A_1, concanavalin A, and a number of catecholamines, cholinergic agents, and peptide hormones. The latter agents were also ineffective in stimulating the enzyme from the villous and crypt cell homogenates, microsomes, and mucosal scrapings. The basal levels of cyclic GMP decreased from crypt to villous cells, while the guanylate cyclase activity increased. $CaCl_2$ slightly depressed the cyclic GMP levels, while alloxan strongly elevated the cyclic GMP levels but had no effect on the cyclic AMP levels. Theophylline significantly elevated the cyclic AMP levels but did not affect the cyclic GMP levels. Ionophore A-23187, choleratoxin, prostaglandins, concanavalin A, and various cholinergic agents and hormones had no effect on the cyclic GMP levels.

5576 EFFECTS OF FASTING AND FEEDING AND PILOCARPINE ON PANETH CELLS OF THE MOUSE. *(E.)* Ahonen, A.; Penttila, A. (Dep. Anat., Univ. Helsinki, Finland). *Scand. J. Gastroenterol.* 10(4):347-352, 1975.

The effects of pilocarpine and fasting, with or without refeeding, on the Paneth cells of the mouse were studied. Fasted adult mice of both sexes were treated i.p. with nialamide (500 mg/kg), followed 1.5 hr later with pilocarpine (100 mg/kg, i.p.), and 0.5 hr after that with dopamine (100 mg/kg, i.p.); controls were treated only with nialamide and dopamine. Another group of mice was fasted for 2 days, then, in some cases, allowed to eat for 2 hr, and then treated with nialamide and dopamine as above. The animals were killed 1, 2, 3, 4, 5, or 6 hr after dopamine administration and samples of the duodenum and midjejunum were stained and examined by light and fluorescence microscopy; the dopamine-labeled secretory granules of the Paneth cells were counted. Pilocarpine stimulated the extrusion of granules from the cytoplasm of the cells and significantly decreased the number of granules, whereas fasting for 2 days without refeeding significantly increased the number of granules/cell. Refeeding following 2 days fasting had no effect on the Paneth cells of the duodenum, but resulted in a significant decrease in the number of granules in the jejunal Paneth cells compared with the number seen after fasting without refeeding. The data indicate that pilocarpine is able to stimulate the secretory mechanism of the Paneth cells, and suggest that the secretory mechanisms of these cells may be regulated in a different way in various regions of the gastrointestinal tract.

5577 RESULTS OF ORTHOTOPIC HOMOTRANSPLANTATION OF THE SMALL BOWEL IN THE SWINE. *(Fr.)* Hay, J. M.; Fagniez, P. L.; Parc, R.; Kunlin, A.; Villiers, P.; Vaiman, M.; Remy, J.; Bsowsky, A.; Chomette, G.; Clot, J. P.; Nizza, P.; Garnier, H. (Appl. Radiobiol. Lab., Commis. At. Energy, JOUY-en-JOSUS, France). *Ann. Chir.* 28(12):1063-1070, 1974.

5578 THE EFFECT OF RADIOPROTECTIVE BIOGENIC AMINES ON LIPID PEROXIDATION OF MICROSOMES OF RAT INTESTINAL MUCOSA. *(Rus.)* Sobolev, A. S.; Merzliak, M. N.; Zhamsaranova, S. D.; Goncharenko, E. N.; Kudriashov, Iu. B. (M. V. Lomonosov Moscow State Univ., USSR). *Dokl. Akad. Nauk SSSR* 222(2):476-479, 1975.

5579 EVIDENCE OF MAJOR ROLE OF THE INTESTINE IN CHOLESTEROL SYNTHESIS IN THE ADULT MALE RAT. *(E.)* Chevallier, F.; Magot, T. (Lab. Physiol. Nutr., Univ. Paris, France). *Experientia* 31(6):627-629, 1975.

5580 GLUCOSE-STIMULATED REVERSAL OF SECRETION TO ABSORPTION IN INTESTINAL OBSTRUCTION. *(E.)* Coan, M. G.; Costantini, F.; Fellner, J.; Wright, H. K. (Yale Univ. Sch. Med., New Haven, Conn.). *Surg. Forum* 24:420-421, 1973.

5581 TIME/DOSE RELATIONSHIPS IN ABDOMINAL IRRADIATION: A DEFINITION OF PRINCIPLES AND EXPERIMENTAL EVALUATION. *(E.)* Hagemann, R. F.; Concannon, J. P. (Allegheny Gen. Hosp., Pittsburgh, Pa.). *Br. J. Radiol.* 48(571):545-555, 1975.

5582 ELECTROFOCUSING SEPARATION OF INTESTINAL MALTASES IN THE RAT. *(E.)* Suduka, P.; Delmont, J.; Rigat, A. M. (Fac. Med., Nice, France). *Digestion* 11(5/6):459-460, 1974.

5583 ON THE SPECIFICITY OF THE ENZYME RELEASE IN THE SMALL INTESTINE OF THE RAT. *(E.)* Roduner, J.; Honegger, J.; Hauri, H. P.; Goetze, H.; Hadorn, B. (Dep. Pediatr., Univ. Berne, Switzerland). *Digestion* 11(5/6):457-458, 1974.

5584 MUSCARINIC RECEPTORS IN RAT INTESTINAL MUSCLE: COMPARISON WITH THE GUINEA PIG. *(E.)* Taylor, I. K.; Cuthbert, A. W.; Young, M. (Univ. Cambridge, Med. Sch., England). *Eur. J. Pharmacol.* 31(2):319-326, 1975.

5585 PREDICTION OF INTESTINAL VIABILITY USING DOPPLER ULTRASOUND TECHNICS. *(E.)* Wright, C. B.; Hobson, II, R. W. (Walter Reed Army Med. Cent., Washington, D. C.). *Am. J. Surg.* 129(6):642-645, 1975.

5586 STUDIES OF THE EFFECTS OF BLOCKAGE OF INTESTINAL LYMPHATICS: III. TEMPORARY ISOLATION OF LYMPHEDEMATOUS BOWEL FROM INTESTINAL CONTINUITY. *(E.)* Wilk, P.; Karipineni, R.; Dreiling, D. A.; Danese, C. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *Am. J. Gastroenterol.* 63(5):400-403, 1975.

5587 DETECTION OF CIRCULATING ANTIGEN IN RATS WITH SMALL BOWEL ADENOCARCINOMA. *(E.)* Englund, C. W.; Stevens, R. H.; Cheng, H. F.; Osborne, J. W. (Med. Lab., Iowa Univ., Iowa City). *Radiat. Res.* 62(3):603, 1975.

5588 RADIATION-INDUCED INTESTINAL TUMORS IN RATS: CORRELATION BETWEEN THE AMOUNT OF THE CIRCULATING TUMOR-RELATED ANTIGEN(S) AND TUMOR SIZES. *(E.)* Cheng, H. F.; Cantarero, L.; Osborne, J. W. (Med. Lab., Univ. Iowa, Iowa City). *Radiat. Res.* 62(3):604, 1975.

5589 5-FLUOROURACIL MODIFICATION OF POST-IRRADIATION CELL PROLIFERATION IN THE MOUSE JEJUNUM. *(E.)* Burholt, D. R.; Copper, J. W.; Hagemann, R. F.; Schenken, L. L.; Lesher, S. (Allegheny Gen. Hosp., Pittsburgh, Pa.). *Radiat. Res.* 62(3):545, 1975.

See also, 5199, 5200, 5203, 5204, 5221, 5224, 5226, 5240, 5244, 5276, 5296, 5425, 5601, 5602, 5607, 5610.

GENERAL

5590 EFFECT OF ASPIRIN, BILE SALT, AND ETHANOL ON CANINE GASTRIC MUCOSAL BLOOD FLOW. *(E.)* Cheung, L. Y.; Moody, F. G.; Reese, R. S. (Univ. Utah Coll. Med., Salt Lake City). *Surgery* 77(6): 786-792, 1975.

The effect of aspirin (20 mM), sodium taurocholate (40 mM), and ethanol (25%) on gastric mucosal blood flow was studied in an exteriorized, chambered preparation of canine fundic stomach. Gastric mucosal blood flow was measured by gamma-labeled microspheres and plasma aminopyrine clearance. All three test solutions caused a significant increase in microsphere-measured mucosal blood flow which was proportional to the severity of gross mucosal injury, being greatest with bile salt and least with ethanol. Plasma aminopyrine clearance determined only a small fraction of mucosal flow measured by microspheres following injury, particularly in sodium taurocholate and ethanol experiments, where the net hydrogen ion back diffusion was greatest. The results suggest that increased gastric mucosal blood flow may be a secondary defensive response to the damage caused by these irritants and that plasma aminopyrine clearance is unreliable in quantitating mucosal blood flow changes in the presence of mucosal injury.

5591 STRUCTURAL AND HORMONAL ALTERATIONS IN THE GASTROINTESTINAL TRACT OF PARENTERALLY FED RATS. *(E.)* Johnson, L. R.; Copeland, E. M.; Dudrick, S. J.; Lichtenberger, L. M.; Castro, G. A. (Univ. Texas Med. Sch., Houston). *Gastroenterology* 68(5, Part 1):1177-1183, 1975.

The structural and hormonal properties of the gastrointestinal tract were compared in six male Sprague-Dawley rats maintained by i.v. hyperalimentation and in six sham-operated controls. Control rats gained twice as much weight (78 *versus* 34 g) as parenterally-fed animals over a 19-day period. Kidney, spleen and testes weights did not differ between the two groups. Weights of a 2 cm portion of small intestine and of whole stomach were 73% and 25% greater, resp., in the control rats. Although antral weights were unchanged, antral gastrin was decreased by 30-fold in parenterally-fed animals. Oxyntic gland area and forestomach weights were decreased by 35%. The decrease in antral gastrin occurred early within the first 8 days after initiation of hyperalimentation. Total small intestine DNA content was decreased 2-fold and the RNA:DNA ratio was increased almost 2-fold in parenterally-fed rats, suggesting gut hypoplasia with hypertrophy of remaining cells in the experimental group. Pancreatic weight was decreased by 67% in hyperalimented rats. These results indicate that oral food ingestion is necessary to maintain structural integrity of certain tissues and accessory glands of the gastrointestinal tract and to maintain normal tissue gastrin stores.

5592 FISSION OF CRYPTS IN THE SMALL INTESTINE OF THE IRRADIATED MOUSE. *(E.)* Cairnie, A. B.; Millen, B. H. (Dep. Biol., Queens Univ., Kingston, Canada). *Cell Tissue Kinet.* 8(2):189-196, 1975.

Mouse small intestine was irradiated to determine if the number of crypts is eventually restored to normal after irradiation, and to determine the mechanism of increase in crypt number. LAF1 mice were given whole body irradiation at 21 or 66 rads/min. Tritiated thymidine (100 µCi) was injected i.p. 1 hr before sacrifice. Three mice each were killed at 3, 5, 7, 14, and 21 days after irradiation at 21 rads/min. There were also three unirradiated controls. Mice given 66 rads/min were killed: three at 2, 3, 4, and 5 days; two at 6, 7, 14 and 21 days; three at 32, and two unirradiated controls at 32 days. Small pieces of epithelium were dissected from three widely separated areas of the intestine, the villi and muscular layer removed and the crypts counted. They were then placed in scintillation vials for determination of tritium activity. The number of villi in fragments from the same three areas were counted and the tritium activity determined. Crypt and villus counts were only made for the mice exposed to the lesser dose. At 1 day after irradiation, crypts were collapsed in appearance. At 3 days there were a few obvious regenerating crypts, and by 5 days there were enough regenerating crypts to begin counting (0.27 x 10^6 crypts, as compared to 1.18 x 10^6 in the controls). The number steadily increased until it approached normal at 21 days, but the crypts were larger than normal. Very large crypts were found at 4-7 days, and budding was observed on the sides and bases of many. Forked crypts, suggestive of fission, were seen from 6 days on. These were not seen before 5 days, or in controls. It is concluded that increase in crypt number is at least partially due to fission of existing crypts, and that there is probably a compensatory feedback control regulating the number of crypts/animal.

5593 CULTURE OF ZOLLINGER-ELLISON TUMOR CELLS. *(E.)* Lichtenberger, L. M.; Lechago, J.; Dockray, G. J.; Passaro, Jr., E. (Univ. California Los Angeles Sch. Med.). *Gastroenterology* 68(5):1119-1126, 1975.

astrin-secreting Zollinger-Ellison tumor cells were rown *in vitro* to allow study of the molecular form f the hormone, the kinetics of cell growth and the ffects of stimulants and inhibitors on cell growth. umor biopsies were obtained from six patients, and ncubated in a minimal essential medium at 37 C. he medium was replaced every third day, and the sed medium stored and radioimmunoassayed for gas-rin. Cells were subcultured onto coverslips, fixed, nd stained with hematoxylin and eosin. For gastrin adioimmunoassay, pure, natural G-17 gastrin was sed as both standard and label (on iodination with ^{25}I). Used medium was incubated with trypsin and ractionated by Sephadex chromotography. To calcu-ate doubling time, a 1:100 cell dilution was seeded; fter cells became adherent, various fields contain-ng single cells were marked, left for a week, and he cells/resulting clone were counted, after 7, 21, 9, and 70 hr. For electron microscopy, cells were ixed in glutaraldehyde, and postfixed and stained ith osmium tetroxide. To measure gastrin concen-ration after stimulation, old medium was replaced ith 5.0 ml fresh fetal calf medium, and 0.25 ml amples were removed at 2.5, 10, 20 and 30 min. In ll cases, explants adhered to the glass and cell utgrowths occurred within a week. Cell population onsisted of epithelial and fibroblast-like cells in arying ratios, the latter becoming predominant after -3 months. Cells increased in number exponentially, nd doubling time was 65 hr. Cultures derived from umors at the head of the pancreas or adjacent lymph odes had the highest tissue and medium hormone levels, while the lowest levels were from large liver umors. In all cases, medium gastrin concentration ecreased with time; there were negligible amounts fter 2-7 weeks. In about 5% of the cultures, gastrin was still present after 2 months. Gel filtration chromatography of culture medium showed a major peak of radioimmunoassayable gastrin before the ^{125}I-gastrin standard, with an elution volume closely corresponding to that of G-34. There was also a minor peak of gastrin eluting at the expected location of unlabeled G-17 I. Fractionation of tumor extract showed a major peak of G-17 and a minor one of G-34, the reverse of the cultured cells. Medium gastrin concentration increased 4-10 fold for 30 min after addition of fresh medium in two lines. Over 60% of the cells from a line cultured for 2 weeks contained cytoplasmic granules 150-200 nm in diameter, in contrast to the 250-300 nm diameter granules in the original tumor. Prominent rough endoplasmic reticulum and Golgi bodies were present in both. After 6 weeks in culture, less than 10% of the cells contained a few granules, while lysosomes and autophagic vesicles were more common. It is concluded that cell doubling time was 65 hr, gastrin secretion decreased with time as epithelial cells were replaced by fibroblasts, and fresh medium stimulated secretion.

5594 FUNCTIONAL STUDIES OF PEYER'S PATCHES: EVIDENCE FOR THEIR PARTICIPATION IN INTESTINAL IMMUNE RESPONSES.

(E.) Muller-Schoop, J. W.; Good, R. A. (Sloan-Kettering Inst. Cancer Res., New York, N.Y.). *J. Immunol.* 114(6):1757-1760, 1975.

The pattern of responsiveness of Peyer's patch, splenic, mesenteric, and inguinal node lymphocytes was studied in guinea pigs following p.o. and parenteral antigenic stimulation. Live bacille Calmette Guerin (BCG) bacilli or heat-killed mycobacteria (*Mycobacterium tuberculosis*) were administered to male Hartley guinea pigs *via* stomach tube; in other animals, heat-killed mycobacteria in Freund's adjuvant were injected into the left front footpad. The guinea pigs were exsanguinated and lymphocyte suspensions prepared from the intestinal Peyer's patches, spleens, and mesenteric and inguinal lymph nodes. These cultures were stimulated *in vitro* with purified tuberculin derivative (PPD) or with Clostridia. After p.o. immunization with BCG, the Peyer's patch lymphocytes showed the best *in vitro* proliferative responses to PPD. Responsiveness to Clostridia was also significant in the Peyer's patch lymphocytes and low or absent in the other lymphoid tissues examined. In animals immunized parenterally with heat-killed mycobacteria, the splenic lymphocytes reacted best to PPD, the Peyer's patch lymphocytes giving the smallest reaction. Selective elimination of B or T cells from the PPD-reactive Peyer's patch lymphocyte populations showed that the T cell-rich fraction remained responsive to PPD, while the B cell-rich fraction became unresponsive; both fractions reacted to Clostridia. The results indicate that a functional T cell population is present in the Peyer's patch and that these organs in the guinea pig are immunocompetent lymphoid organs which seem to be primarily engaged in the production of immune responses to antigens presented from the intestinal lumen.

5595 THE DIGESTIVE TRACT IN TOTAL PARENTERAL NUTRITION.

(E.) Koga, Y.; Ikeda, K.; Inokuchi, K.; Watanabe, H.; Hashimoto, N. (Kyushu Univ. Sch. Med., Fukuoka, Japan). *Arch. Surg.* 110(6):742-745, 1975.

The effects of long-term complete parenteral nutrition on the morphology of different parts of the digestive tract were studied in 8- to 10-week-old puppies. The puppies were maintained for 4 or 8 weeks on an i.v. solution providing 140 calories/kg/day; control animals were fed a commercial diet providing the same number of calories/day. The animals were killed on the last day of the experiment and measurements were made of the length and weight of the small intestine. The thickness of the mucosa and muscular coat of the small intestine and the number of cells in mitosis and the number of argentaffin cells among the epithelial cells of the jejunal crypts were also measured. In the puppies maintained on total parenteral nutrition, the development of the gastrointestinal tract was markedly disturbed, with reductions in length, weight, and thickness of all intestinal layers; in general, these changes were more marked in the 8-week experimental group. In contrast, the microscopic structures were well preserved. There was no noticeable difference between the experimental and control animals in gastric pit:gland ratio, villus:crypt ratio, cellular component, content of periodic acid-Schiff-positive substance, or the distribution of sudanophilic fat in the mucosal membrane. However, there was a reduction in the mitotic index in the jejunal crypt in the experimental animals. Growth, development, and weight gain were basically normal in the 4-week experimental animals, but weight gain was somewhat reduced in the 8-week group. Stool output of the experimental animals was scanty, and mucus stools were evacuated once or twice/week. The results suggest that in complete parenteral nutrition, cell production in the digestive tract may be decreased due to decreased cell loss. They also suggest that the passage of diet through the small intestine is essential for the development of length in this organ.

5596 IMMUNOGLOBULIN E (IgE) AND IgE-CONTAINING CELLS IN HUMAN GASTROINTESTINAL FLUIDS AND TISSUES. *(E.)* Brown, W. R.; Borthistle, B. K.; Chen, S. T. (Dep. Med., Denver VA Hosp., Colo.). *Clin. Exp. Immunol.* 20(2):227-237, 1975.

The distribution of IgE immunocytes along the intestine and the IgE content of the intestinal fluids were studied in healthy human subjects and in patients with various digestive diseases. Samples of gastric, duodenal, jejunal, rectal, and colonic tissues were examined with immunohistological and single- and double-antibody radioimmunoassay techniques; the intestinal fluid samples were also examined by single- and double-antibody radioimmunoassay and the 4 specimens containing the largest quantities of IgE were analyzed by sucrose gradient ultracentrifugation. IgE-containing cells were identified in all tissue specimens examined, although they were less numerous than IgA, IgG, and IgM immunocytes; they comprised about 2% of the total immunofluorescent-positive cell population. The total number of immunoglobulin-forming cells of all classes, the absolute number of IgE-containing cells, and the percentage of IgE-containing cells decreased along the intestine from stomach to rectum. IgE immunocytes were at least 10-fold more numerous at the bases of gastric and duodenal peptic ulcers than elsewhere in these tissues, and the number of IgE-type cells in the rectal tissues of 2 patients with Crohn's disease and 1 patient with chronic ulcerative colitis was 3- to 5-fold greater than in the rectal tissues of subjects with other or no colonic diseases. Measurable IgE was found in 92% of the intestinal fluid samples; the concentration did not differ significantly among normal subjects and patients with various digestive diseases. Sucrose gradient ultracentrifugation analysis revealed that the immunologically reactive IgE was largely present in fractions corresponding to molecules of lower molecular weight than that of albumin, which suggest that IgE in the gut contents is degraded by proteolytic enzymes. The results suggest that IgE antibodies are available for participation in local reaginic-type reactions in the gut.

5597 ESCAPE FROM VASOCONSTRICTION IN THE GASTRIC MICROCIRCULATION. *(E.)* Guth, P. H.; Smith, E. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Am. J. Physiol.* 228(6):1893-1895, 1975.

The possible occurrence of escape from vasoconstriction in the gastric microcirculation, and the involvement of submucosal shunt opening in this phenomenon, was studied in male Wistar rats. Using an image-splitting TV microscope recording system, the response of the gastric submucosal arterioles (13-33 µm) to 3 min of left splanchnic nerve stimulation (8 V), norepinephrine superfusion (0.2-0.7 µg/min), and vasopressin superfusion (.0025-.005 U/min) was studied. All stimuli produced initial vasoconstriction, the average maximum vasoconstriction diameter being 72-79.9% of control values. With sympathetic nerve stimulation and norepinephrine superfusion, the initial vasoconstriction was followed by escape in all animals, the average escape index (relative degree of escape from vasoconstrictor stimulation) being 0.64 after sympathetic nerve stimulation and 0.77 after norepinephrine superfusion. In neither case was significant poststimulation dilatation observed. In contrast, escape occurred in only 1 animal after vasopressin superfusion, the mean escape index in this group being -0.50; again, significant poststimulation dilatation was not observed. No arteriovenous shunts were seen. The results indicate that the gastric submucosal arterioles exhibit an escape phenomenon following adrenergic stimulation, suggesting that "autoregulatory escape" in other splanchnic beds may also be due to the relaxation of constricted vessels and not to the opening of shunts.

5598 VITAMIN B_{12} ABSORPTION IN X-IRRADIATED RATS. *(E.)* D'Souza, D. W.; Vakil, U. K.; Sreenivasan, A. (Biochem. Food Technol. Div., Bhabha At. Res. Cent., Bombay, India). *Environ. Physiol. Biochem.* 5(1):37-48, 1975.

The effect of whole-body exposure to a sublethal dose of x-irradiation on the intestinal submucosal absorption of vitamin B_{12} was studied in male Wistar rats. Weanling rats were provided with adequate nutrition or maintained on vitamin A-deficient diets; after 3 weeks, the animals were placed on low (8%) or adequate (20%) diets. Two weeks later, the animals were x-irradiated (400 rad) or were sham-irradiated. Vitamin B_{12} absorption was measured in intestinal loop segments following the injection of vitamin B_{12} (with or without gastric juice from normal rats) into several ligated intestinal segments. The distribution of radioactivity in the serum and tissues was also measured after i.p. (0.5 µCi) or p.o. (1 µCi) administration of ^{57}Co-B_{12}. The rate of absorption of vitamin B_{12} from the intestinal loops of adequately nourished rats was decreased by x-irradiation, the inclusion of gastric juice from normal rats having no effect on the rate. A severe interference in the absorption and retention of p.o. ^{57}Co-B_{12} was also observed in the irradiated rats: this was evidenced by low serum B_{12} levels, decreased organ uptake of B_{12}, and increased B_{12} excretion. However, when the vitamin was administered i.p., its uptake by various organs was not affected by x-irradiation. Atrophy of the intestinal cells in the animals maintained on a low-protein diet accentuated the adverse effects of radiation on B_{12} absorption; vitamin A deficiency had no appreciable effect on B_{12} absorption by the x-irradiated animals. A sharp drop in viable intestinal flora was observed within 24 hr after irradiation, but their numbers were found to increase after 3 days. The results suggest that the observed morphological degeneration of mucosal cells in the x-irradiated animals was the primary reason for the B_{12} malabsorption seen after x-ray exposure.

5599 INTESTINAL BLOOD FLOW: AN EVALUATION BY CLEARANCE OF XENON Xe 133 FROM THE CANINE JEJUNUM. *(E.)* Wilson, S. E.; Hiatt, J.; Winston, M.; Passaro, E., Jr. (VA Wadsworth Hosp., Los Angeles, Calif.). *Arch. Surg.* 110(7):797-801, 1975.

Blood flow to the small bowel was assessed by measuring the clearance of xenon from the canine jejunum. ^{133}Xe was injected into the submucosa and muscularis of the jejunum in five anesthetized male mongrels. A thyroid-uptake type scintillation probe was used to register isotope clearance, the rate of disappearance or "washout curve" being used to determine the tissue blood flow following varying degrees of partial aortic occlusion. The shapes of the plotted washout curves from submucosa and muscularis were characteristic and reproducible, a steep or rapid initial component being consistently followed by a slower component. The calculated xenon clearance rates for both tissues (expressed as half-times for isotope disappearance and plotted as a function of decreasing superior mesenteric artery flow) were characteristically rapid for a broad range of superior mesenteric artery flows (90-600 ml/min). With reduction of the superior mesenteric artery flow beyond 80 ml/min, the tissue clearance of xenon was markedly prolonged. Adequate perfusion of the vascular compartments of the small bowel as measured by xenon clearance was maintained until reduction of the superior mesenteric artery flow beyond 80 ml/min. The data suggest that mesenteric vascular obstruction may be considerable before tissue perfusion is markedly reduced, provided that colonic vascular auto-regulation is similar to that of the jejunum. The clearance of a xenon injection from the intestinal parenchyma may, therefore, represent a useful and readily available tool for use in the diagnosis of vascular insufficiency of the bowel.

5600 IMMUNOGENICITY OF LIPID-CONJUGATED PROTEIN IN THE INTESTINE. *(E.)* Heatley, R. V.; Stark, J. M. (Welsh Natl. Sch. Med., Cardiff). *Immunology* 29(1):143-149, 1975.

Lipid-conjugated human serum albumin (HSA) was tested for its ability to induce antibody production, molecular aggregation, and a tendency to attach to cells in female Wistar rats; the amounts of undigested antigen draining in the intestinal lymph were also measured, as was the anticomplementary activity of the antigens. HSA was acylated with lauroyl chloride; different degrees of fatty acid attachment were achieved by differing the molar ratios of lauroyl chloride to protein. Rats were immunized with untreated or lauroylated HSA by i.m. injection (1 mg followed 28 days later by 100 μg) or by injection into the lumen of the small bowel (10 mg followed 28 days later by 1 mg). *In vitro,* rat peritoneal cell suspensions were incubated for 1 hr with acylated protein or HSA exposed to the solvent mixtures required for acylation but without lauroyl chloride (CHSA). The antibody response to lauroylated HSA was significantly greater than that to untreated HSA or CHSA, the response tending to decrease with increasing degrees of acylation. Similar results were obtained with i.m. injection and injection into the small bowel, although the differences in response obtained with the acylated and nonacylated proteins were less clearly defined in the latter case. The increased immunogenicity of the acylated protein was associated with increased molecular aggregation and cellular adherence, the degree of polymerization and percentage attachment increasing with increased acylation. Acylation also reduced the drainage of undigested antigen through the lymphatics. All acylated proteins showed some anticomplementary activity, which increased with the degree of acylation. The data suggest that if lipid-associated protein with an insufficiently hydrophilic surface is absorbed from the gut, an immunogenic event may ensue which in humans might play a role in the pathogenesis of a variety of inflammatory disorders of the gastrointestinal tract for which an immunological basis has been postulated.

5601 ANTIBACTERIAL MECHANISMS IN THE INTESTINE: ELIMINATION OF V. cholerae FROM THE GASTROINTESTINAL TRACT OF ADULT MICE. *(E.)* Knop, J.; Rowley, D. (Dep. Microbiol., Univ. Adelaide, Australia). *Aust. J. Exp. Biol. Med. Sci.* 53(2):137-146, 1975.

5602 ANTIBACTERIAL MECHANISMS IN THE INTESTINE: ELIMINATION OF V. cholerae FROM THE INTESTINES OF INFANT MICE AND THE ROLE OF ANTIBODY. *(E.)* Knop, J.; Rowley, D. (Dep. Microbiol., Univ. Adelaide, Australia). *Aust. J. Exp. Biol. Med. Sci.* 53(2):147-154, 1975.

5603 GASTROINTESTINAL HORMONES AND NEURAL INTERACTION WITHIN THE CENTRAL NERVOUS SYSTEM. *(E.)* Dafny, N.; Jacob, R. H.; Jacobson, E. D. (Univ. Texas Med. Sch., Houston). *Experientia* 31(6):658-660, 1975.

5604 THE INFLUENCE OF ANTIGENIC STIMULATION ON THE ONTOGENY OF LYMPHOID AGGREGATES AND IMMUNOGLOBULIN-CONTAINING CELLS IN MOUSE BRONCHIAL AND INTESTINAL MUCOSA. *(E.)* Milne, R. W.; Bienenstock, J.; Perey, D. Y. E. (McMaster Univ. Med. Cent., Hamilton, Canada). *J. Reticuloendothel. Soc.* 17(6):361-369, 1975.

5605 HYPEREMIA AS A MEASURE OF VIABILITY IN REVASCULARIZED ISCHEMIC INTESTINE. *(E.)* Zarins, C. K.; Skinner, D. B.; Rhodes, B. A.; James, Jr., A. E. (Dep. Surg., Univ. Michigan, Ann Arbor). *Surg. Forum* 24:416-417, 1973.

5606 VARIATIONS OF THE ARTERIAL SUPPLY OF THE DUODENUM AND THE PANCREAS IN THE DOMESTIC CAT (Felis domestica BRISSON). *(E.)* Gomercic, H.; Babic, K. (Vet. Fac., Univ. Zagreb, Yugoslavia). *Acta Anat.* 91(2):213-221, 1975.

5607 HOMOGRAFT OF THE SMALL INTESTINE. METABOLIC AND FUNCTIONAL CHANGES CAUSING IRREVERSIBLE SHOCK. *(E.)* Garrido, H.; De Diego, J. A.; Cano, C.; Lucea, C.; Escribano, P. M.; Manzanos, A. (Hosp. Clin. San Carlos, Madrid, Spain). *Int. Surg.* 60(6/7):351-354, 1975.

5608 VASCULARIZATION OF THE RECTO-ANAL SEGMENT. *(It.)* Chiampo, L.; Percudani, M.; Scarpelli, F.; Paroni, R. (Inst. Pathol., Univ. Parma, Italy). *Ateneo Parmense* [*Acta Biomed.*] 45(3):149-169, 1974.

5609 ACTIVITY OF CERTAIN ENZYMES OF THE ALIMENTARY CANAL AND OF THEIR INHIBITORS UNDER THE ACTION OF RADIATION AND THIOPHOSPHAMIDE. *(Rus.)* Savitsky, I. V.; Korpovich, G. A. (N.I. Pirogov Med. Inst., Odessa, USSR). *Radiobiologiia* 15(1):120-124, 1975.

5610 STUDIES ON PROTEINASE LEVEL IN GASTROINTESTINAL TRACT AND DIGESTIVE GLANDS IN PYRIDOXINE DEFICIENT ANIMALS. *(E.)* Ghose, C. R.; Ghosh, A. K. (Dep. Biochem., Univ. Calcutta, India). *Jpn. J. Exp. Med.* 45(2):101-104, 1975.

5611 THE EFFECTS OF TEMPERATURE AND 2,4-DINITROPHENOL ON TRANSMEMBRANE POTENTIALS OF SUBMANDIBULAR ACINAR CELLS. *(E.)* Creed, K. E.; McDonald, I. R. (Dep. Physiol., Monash Univ., Clayton, Victoria, Australia). *J. Physiol.* 247(3):521-535, 1975.

5612 THE INFLUENCES OF CHANGES IN TEMPERATURE ON INTESTINAL LYMPH FLOW AND RELATIONSHIP TO OPERATIONS FOR CARCINOMA OF THE INTESTINE. *(E.)* Ackerman, N. B. (Upstate Med. Cent., Syracuse, N.Y.). *Surg. Gynecol. Obstet.* 140(6):885-888, 1975.

5613 CO-CARCINOGENESIS IN THE RAT GASTROINTESTINAL SYSTEM. *(E.)* Vogel, Jr., H.H.; Sebes, J. I. (Univ. Tennessee Cent. Health Sci., Memphis). *Radiat. Res.* 62(3):596-597, 1975.

5614 OPSONIC CHARACTERISTICS OF CHYLOMICRON-BOUND PROTEIN. *(E.)* Mayron, L. W.; Tonaki, H.; Kaplan, E. (VA Hosp., Hines, Ill.). *Proc. Soc. Exp. Biol. Med.* 149(1):248-253, 1975.

See also, 5217, 5219.

DIAGNOSTIC PROCEDURES

5615 ELECTROCOAGULATION BIOPSY WITH SPECIAL REFERENCE TO HISTOLOGIC DIAGNOSIS OF GASTRIC LIPOMA. *(E.)* Yoshida, T.; Nakamura, Y.; Nakamura, K.; Watanabe, H.; Tanaka, K. (Med. Coll. Miyazaki, Japan). *Gastrointest. Endosc.* 21(4):156-158, 1975.

The applicability of electrocoagulation biopsy to submucosal tumors of the stomach was illustrated in the histological diagnosis of two gastric lipomas. The two cases were initially diagnosed as submucosal tumor by roentgenologic and endoscopic examinations, with a negative result by routine biopsy, but were later proved to be lipoma by means of electrocoagulation biopsy. Submucosal tissue from intramural tumors could be obtained by biopsy through the ulcerative lesion several days after electrocoagulation. Electrocoagulation biopsy is recommended for making a histologic documentation of tumors covered by intact mucosa or of small tumors found incidentally; it is considered simple, safe, and easy.

5616 DEVELOPMENT OF AN INTRAVENOUS BILE ACID TOLERANCE TEST: PLASMA DISAPPEARANCE OF CHOLYLGLYCINE IN HEALTH. *(E.)* Korman, M. G.; LaRusso, N. F.; Hoffman, N. E.; Hofmann, A. F. (Mayo Clin., Rochester, Minn.). *N. Engl. J. Med.* 292(23): 1205-1209, 1975

The plasma disappearance of i.v. injected cholylglycine was studied in man by a radioimmunoassay to develop an i.v. bile acid tolerance test. Cholylglycine (1-7.5 mg/kg) was injected into six healthy men at 3 hr intervals at three different dosages to determine the optimal dose; 5 μM/kg was selected for subsequent tests. Forty-five healthy subjects were then injected with the optimal dose of cholylglycine and serial samples of venous blood were collected for radioimmunoassay, specific for conjugates of cholic acid. Cholylglycine disappearance was rapid (2.6 min half-life); the rate of disappearance was independent of dose between 2 and 15 μM/kg. The conjugates of cholic acid increased 10-fold, but the concentration of those bile acids returned to 1 μM by 10 min. No side effects were observed. The results suggest that cholylglycine may be an ideal substance for an i.v. tolerance test for defining hepatic functional mass and that its plasma disappearance may provide the basis for a convenient, safe and sensitive test for detection of liver disease.

5617 CASCADE STOMACH: ROENTGEN APPEARANCE AND SIGNIFICANCE. *(E.)* Keller, R. J.; Khilnani, M. T.; Wolf, B. S. (Mt. Sinai Hosp., New York, N.Y.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(4):746-754, 1975.

Cascade stomach was precisely described so that it can be recognized in the erect position at the onset of a barium series. In the erect position, the presence of a posterior "ridge" which delineates a boundary between the fundus and body of the stomach was used to define the presence of a cascade configuration. Such configuration of the stomach, which is seen in the absence of significant pathologic abnormality, is most often associated with a gas distended distal transverse colon or proximal limb of the splenic flexure. True physiological or normal cascade is not very common; patients with a cascade stomach have demonstrated a variety of lesions, both intrinsic and extrinsic, primarily related to the posterior wall of the stomach. It is suggested that a cascade stomach should not be considered physiologic or within normal limits until a detailed examination of the area is performed.

5618 ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY IN PATIENTS WITH GASTRECTOMY AND GASTROJEJUNOSTOMY (BILLROTH II). A CASE FOR THE FORWARD LOOK. *(E.)* Katon, R. M.; Bilbao, M. K.; Parent, J. A.; Smith, F. W. (Univ. Oregon Med. Sch., Portland). *Gastrointest. Endosc.* 21(4):164-165, 1975.

The use of a fiberscopic endoscope with a forward-viewing optical system was described for cannulation through the afferent loop of a Billroth II anastomosis. Twelve procedures were performed on 10 patients with a distal gastrectomy and Billroth II gastrojejunostomy. A side-viewing fiberduodenscope was used in four patients. Delays and difficulties in identifying and entering the afferent loop and in introducing the instrument through the loop to the papilla of Vater were encountered with all four patients. With the forward-viewing fiberscope used in six patients, the afferent loop was easily identified, entered, and followed to its blind termination. The authors recommend use of the forward-viewing instrument for endoscopic cannulation of the duodenal papilla in patients with gastrojejunostomy but urge particular caution in endoscopy of the afferent limb.

5619 ENDOSCOPIC DIAGNOSIS OF GASTRIC CANCER WITH DYE SCATTERING. *(E.)* Ida, K.; Hashimoto, Y.; Takeda, S.; Murakami, K.; Kawai, K. (Murakami Mem. Hosp., Kyoto, Japan). *Am. J. Gastroenterol.* 63(4):316-320, 1975.

A dye scattering technique was used for the diagnosis of early cancer of the stomach. The examination was performed on 41 patients with early and advanced gastric cancer; indigocarmine was used in 33 cases, methylene blue in two patients, and both dyes in four cases. With routine endoscopy, 35/41 cancerous lesions were diagnosed correctly; with the dye technique, 40/41 lesions were correctly diagnosed. The morphology of the gastric mucosal surface was well defined by the dye scattering technique. In 12 lesions, the whole contour of the cancerous lesion was detected by both methods; in 20/29 lesions, the borders could be completely outlined with dye scattering but only partially defined by routine endoscopy. The dye technique allowed for delineation of minimal depressions in the gastric mucosa; depressions were seen in 12/15 patients in whom no lesion was recognized by routine endoscopy. A correlation was observed between degree of abnormality of surface structure and the depth of cancer infiltration. The indirect dye scattering method is considered helpful in the clinical diagnosis of gastric cancer by intensifying and delineating mucosal surface alterations.

5620 VALIDITY AND SENSITIVITY OF AN INTRAVENOUS BILE ACID TOLERANCE TEST IN PATIENTS WITH LIVER DISEASE. *(E.)* LaRusso, N. F.; Hoffman, N. E.; Hofmann, A. F.; Korman, M. G. (Mayo Clin., Rochester, Minn.). *N. Engl. J. Med.* 292(23):1209-1214, 1975.

A bile acid tolerance test, which measures the plasma disappearance rate of injected cholylglycine by radioimmunoassay, was studied in 36 patients with biopsy-proved chronic liver disease and compared to other conventional liver function tests. The patients were divided into two groups: one group of 25 patients had abnormal results on conventional liver function tests and were used to validate the sensitivity and reliability of the test; the other group of 11 patients had liver test results within normal limits and were used to compare the sensitivity of the cholylglycine tolerance test with that of other tests and of the fasting-state conjugated cholic acid test. Cholylglycine (5 μM/kg, i.v.) was injected into each patient and serial samples of blood were collected for determinations of conjugated cholic acid values by radioimmunoassay. In the first group of 25, fasting-state levels of conjugated cholic acid were increased in 20, but plasma disappearance of cholylglycine was delayed in all. In the other group, fasting-state levels of conjugated cholic acid were increased in 3/10, but cholylglycine disappearance was delayed in 9/11. The results suggest that the bile acid tolerance test indicates liver disease more sensitively than the fasting-state level of conjugated cholic acid, which, in turn, is more sensitive than other conventional liver tests.

5621 ^{131}I ROSE BENGAL LIVER SCANNING IN THE DIFFERENTIAL DIAGNOSIS OF NEONATAL JAUNDICE. *(E.)* Wicksman, R. S.; Adcock, D. F.; Bream, C. A.; Scatliff, J. H. (Univ. North Carolina Sch. Med., Chapel Hill). *South. Med. J.* 68(5):599-602, 1975.

The radioiodinated rose bengal abdominal scan was used as the only radioactive testing procedure in diagnosis of congenital biliary atresia in infants, and a count ratio was obtained from the scan data as an additional physiologic measurement. The 21 infants were premedicated with stable iodine, then given 10-30 μCi ^{131}I rose bengal i.v. in rough proportion to body weight. Sequential, anterior abdominal scans were usually obtained at 15 min, 1, 3, 6, 24, and 48 hr after injection. Some lateral scans were also done. Count ratio was determined by marking the point of maximal activity, then recording the 24-hr count over this point and dividing it by the maximal count rate. This indicated degree of retention of the radioisotope in the liver, and varied directly with severity of obstruction. Of 22 scans done on 21 infants, diagnosis based on scan only was incorrect in four instances (82% accuracy). In three of these, severity of the obstruction was overestimated. Eight infants were found to have biliary atresia, and 13 intrinsic liver disease, by open or needle biopsy, autopsy, or clinical course. Those with total obstruction had a mean count ratio of 0.76, while those with intrinsic liver disease had one of 0.45. It is concluded that the rose bengal scan alone had an accuracy of 82%, and that determination of count ratio, at no additional expense, would have improved the accuracy.

5622 FIBERCOLONSCOPY FOR THE DIAGNOSIS OF GRANULOMATOUS COLITIS. *(E.)* Watanabe, H.; Narasaka, T.; Imai, H.; Uezu, J. M.; Numazawa, M.; Shoji, K.; Ishikawa, M.; Yamagata, S. (Tohoku Univ. Sch. Med., Sendai, Japan). *Tohoku J. Exp. Med.* 115(3):285-296, 1975.

The pathological, radiological, endoscopic, and clinical differences between granulomatous colitis and ulcerative colitis were studied to test the effectiveness of fibercolonoscopy in diagnosis of granulomatous colitis. Observations were made on 12 cases of granulomatous colitis and 23 cases of ulcerative colitis. Granulomatous colitis showed cobblestone-like or gyrous lesions, segmentally distributed along the bowel, excepting the rectum. The lesions lacked hemorrhage or suppuration, showed microscopic evidence of transmural inflammation and non-caseating granuloma formation, and showed fissuring and stricture. Characteristic were negative tuberculin tests, diarrhea with no bleeding, palpable abdominal mass, and small bowel involvement In contrast, ulcerative colitis showed continuous, symmetrically distributed lesions, which included the rectum. Lesions were rough or granular, or showed pseudopolyposis, hemorrhage, and suppuration. There was no evidence of non-caseating granuloma formation, fissuring, fistula, or stricture. Blood in the stool and lack of small bowel involvement were characteristic. Fibercolonoscopy combined with biopsy is the only procedure that allows direct observation of the lesions. It is concluded that fibercolonoscopy is quite valuable in diagnosis of granulomatous colitis.

5623 THE "RECTO-SIGMOID INDEX". A MEASUREMENT FOR THE EARLY DIAGNOSIS OF HIRSCHSPRUNG'S DISEASE. *(E.)* Pochaczevsky, R.; Leonidas, J. C. (Mt. Sinai Hosp. Serv., City Univ. New York, N.Y.). *Am. J. Roentgenol. Radium Ther. Nucl. Ther.* 123(4): 770-777, 1975.

Barium contrast studies done on 21 newborns with biopsy-proven Hirschsprung's disease, 10 with the meconium plug syndrome, 12 normal term newborns and five with other gastrointestinal diseases were reviewed. The ratio of the widest diameter of the rectum at a level below the third sacral vertebra to that of the sigmoid loop ("recto-sigmoid index") ranged from 0.7 to 0.9 (mean=0.8) in 10 Hirschsprung's disease patients who had no definite colonic transition segment. In contrast, the indices of normal subjects ranged from 1.0 to 1.9 (mean=1.4) and those of newborns with other disease of the gastrointestinal tract ranged from 1.3 to 1.5 (mean=1.4).

Based on these results, it is suggested that the "recto-sigmoid index" may aid in the diagnosis of Hirschsprung's disease in the newborn without a definite transition segment on the barium contrast study.

5624 DETERMINATION OF SERUM LIPOPROTEIN-X FOR THE EARLY DIFFERENTIATION BETWEEN NEONATAL HEPATITIS AND BILIARY ATRESIA. *(E.)* Campbell, D. P.; Poley, J. R.; Alaupovic, P. (Univ. Oklahoma Health Sci. Cent., Oklahoma City). *J. Surg. Res.* 18(4):385-390, 1975.

A combination of lipoprotein-X determination and cholestyramine treatment was used to differentiate between neonatal hepatitis and biliary atresia. Infants (28) with cholestatic jaundice of etiology not determinable by standard testing had serum lipoprotein-X measured after a 6-hr fast. Those with a positive reaction were given 1 g cholestyramine/day p.o. for 2 weeks, followed by a second lipoprotein-X determination. Of the 28 infants, 14 proved to have biliary atresia on surgical exploration. All 14 were positive for lipoprotein-X. Of these, 13 showed a rise in serum lipoprotein-X levels after the cholestyramine treatment. The serum from the 14th was in transit for 4 days, sufficient time for the lipoprotein-X to dissociate. The remaining 14 infants had intrinsic cholestasis, 12 from neonatal hepatitis. Of the 14, five were positive for lipoprotein-X. After cholestyramine treatment, the lipoprotein-X levels dropped significantly. Six of the nine negative for lipoprotein-X were given the cholestyramine treatment; all remained negative. Of the 28 infants, 27 were diagnosed accurately (96.4%). It is concluded that lipoprotein-X determination coupled with cholestyramine treatment is an accurate and simple method of distinguishing biliary atresia and intrinsic cholestasis.

5625 EMERGENCY PERITONEOSCOPY. *(Ger.)* Baerlocher, C.; Engelhart, G.; Fahrlander, H. (Dep. Med., Univ. Basel, Switzerland). *Leber Magen Darm* 3(1):11-14, 1973.

Emergency peritoneoscopy was introduced in the authors' clinic in 1964 and to date 180 such examinations were performed corresponding with 10% of the total number of laparoscopies. Endoscopic results, shown in tabular form, covered 100 patients with blunt abdominal trauma, including 47 patients with free blood in the abdominal cavity and one with urine due to rupture of the bladder; further, 80 patients without abdominal trauma involving peritonitis, mesenterial infarct, pancreatitis and miscellaneous causes. Data are given on confirmation of the endoscopic findings with clinical course, surgery or autopsy. While the method, described as far back as 1937 and 1942, has not found general acceptance, the authors consider emergency peritoneoscopy a safe procedure, quick to carry out (normally in 10-15 min), tolerated even by seriously ill patients, and of high diagnostic value. In some aspects it may be preferable to other diagnostic procedures such as exploratory puncture or peritoneal lavage. An experienced endoscopy team, however, is a prerequisite.

5626 THE ROLE OF GLUCAGON IN ENDOSCOPIC CHOLANGIOPANCREATOGRAPHY. *(E.)* Silvis, S. E.; Vennes, J. A. (Minneapolis VA Hosp., Minn.). *Gastrointest. Endosc.* 21(4):162-163, 1975.

The effectiveness of glucagon in control of duodenal motility, in promoting efficiency in performing endoscopic cholangiopancreatography, and in preventing pancreatitis was determined in a double-blind study of 55 patients. All patients received dicyclomine (60 mg, i.m.) and atropine (0.4 mg, i.m.) before the procedure. When the duodenoscope was in position, 28 patients received 1 ml glucagon and 27 patients received 1 ml saline. Change in motility was evaluated and urine amylase was obtained. A marked subjective change in motility was noted in 8/17 patients who had received glucagon compared with 2/16 in the placebo group. Twenty-four hours after the procedure, 8% of the patients who had received glucagon and 64% of the placebo patients had an elevated urine amylase value; the mean urinary amylase value was 186 U/hr in glucagon patients and 682 U/hr in placebo patients (statistically significant). One patient who had received glucagon developed cholangitis, and one placebo patient developed mild pancreatitis. The results suggest that glucagon is a safe and valuable means of controlling duodenal motility in endoscopic pancreatocholangiography.

5627 NEW DIAGNOSTIC AND THERAPEUTIC TECHNIQUES IN THE MANAGEMENT OF PYOGENIC LIVER ABSCESSES. *(E.)* Ranson, J. H. C.; Madayag, M. A.; Localio, S. A.; Spencer, F. C. (New York Univ. Med. Cent., New York, N.Y.). *Ann. Surg.* 181(5):508-518, 1975.

The treatment of 14 patients (12 men and 2 women, aged 22-80 yr) operated on for pyogenic liver abscesses was studied. Eight cases (57%) were cryptogenic. Other abscesses were associated with biliary disease (3), abdominal sepsis (2), and trauma (1). Abscesses were present on hospitalization in 12 patients. Clinical findings included fever (101-108 F), 100%; leucocytosis, 71%; anorexia and vomiting, 50%; localized tenderness and hepatomegaly, 50%; hypoalbuminemia, 86%; hypocholesterolemia, 78%; elevated SGOT, 71%; and elevated alkaline phosphatase, 43%. Technetium hepatic scintiscans showed focal defects in 10 of 12 patients (83%), but did not detect multiple abscesses in 2 of these. Hepatic arteriography performed in 10 patients was highly accurate, outlining single abscesses in 6 and multiple abscesses in 4. Furthermore, in one patient a false positive scintiscan was demonstrated by negative arteriography, confirmed by autopsy. In 4 patients, arteriography indicated an abscess in the posterior-superior area of the right hepatic lobe. With precise anatomical localization, a transthoracic approach permitted uncomplicated drainage in each case. This approach provided excellent exposure and direct drainage for abscesses in this area. An additional therapeutic adjunct in 2 patients, with 4 and 11 abscesses each, was postoperative intraportal infusion of antibiotics through the umbilical vein. Thirteen patients (83%) recovered, one dying from pulmonary embolism. Primary hepatic abscesses occur with increasing frequency. The methods described allow more precise preoperative diagnosis and direct surgical drainage.

5628 SUPRAGASTRIC PANCREOSCOPY: LAPAROSCOPY AND BIOPSY OF THE BODY OF THE PANCREAS.

(Ger.) Meyer-Burg, J.; (Steglitz Clin., Free Univ., Berlin, Germany). *Fortschr. Med.* 91(26):1017-1019, 1975.

A report on the direct laparoscopic inspection of the pancreas and its possible value as a diagnostic tool in pancreatic diseases was presented. The operative procedure in performing a laparoscopy was briefly described and visual characteristics of the pancreas were noted in the normal state, in acute and in chronic pancreatitis, and with neoplasms of the pancreas, which are often associated with liver metastases, Courvoisier's law or cholestasis. Clinical data, cited from other publications, included 125 laparoscopies which allowed inspection of parts of the pancreas in 81 (65%) cases. These included 15 patients with pancreatic neoplasms, six patients with chronic pancreatitis, one patient after passage of acute pancreatitis, and one patient with a pancreatic pseudocyst falsely diagnosed as a tumor. In 31 cases material was removed for cytological examination, usually by multiple puncture of each organ in different locations. Admittedly, the limitations of the method reside in the fact that only protions of the pancreas (largely the surface) are accessible to inspection. Also, it does not usually serve in early recognition of a pancreatic neoplasm since most patients do not seek medical help in the beginning stage of the disease. Its chief value, therefore, is its application within the general framework of diagnosing pancreatic diseases.

5629 RADIOSELENUM PANCREOZYMIN-SECRETIN TEST AS A CLINICAL TEST FOR PANCREATIC EXOCRINE FUNCTION.

(E.) Shichiri, M.; Etani, N.; Yoshida, M.; Harano, Y.; Hoshi, M.; Shigeta, Y.; Abe, H. (Osaka Univ. Med. Sch., Japan). *Am. J. Dig. Dis.* 20(5):460-468, 1975.

The appearance of radioselenium in the protein fraction of duodenal aspirates following stimulation with pancreozymin and secretin was investigated. Pancreatic exocrine function was determined in 36 subjects: 17 were classified as normal and 19 had pancreatic diseases including chronic pancreatitis (14), pancreatic carcinoma (3), and pancreatic cyst (2). A good distinction between normal subjects and patients with pancreatic disease was obtained by measuring ^{75}Se-radioactivity in the protein fraction of duodenal aspirates; either cumulative radioactivity during the combined 80 min post-pancreozymin-secretin period or maximum ^{75}Se-specific activity during the postsecretin period was used as an index. It is suggested that this test may be useful and sufficiently reliable for detecting abnormal pancreatic exocrine function. This test can be performed simultaneously with the conventional pancreozymin-secretin test, provocative serum enzyme response to pancreozymin and secretin stimulation, and pancreatic scintiscanning. Inclusion of the cytology test may help to distinguish carcinoma from other pancreatic diseases. The combined test may provide more accurate information on pancreatic exocrine function.

5630 CRITICAL EVALUATION OF HEPATIC SCINTIANGIOGRAPHY FOR NEOPLASTIC TUMORS OF THE LIVER.

(E.) Stadalnik, R. C.; DeNardo, S. J.; DeNardo, G. L.; Raventos, A. (Univ. California Sch. Med., Davis, Sacramento Med. Cent.). *J. Nucl. Med.* 16(7):595-601, 1975.

Dynamic hepatic scintiangiography was compared with histologic and radiopaque diagnostic techniques in the evaluation of suspected hepatic neoplasms in humans. In 92 patients previously diagnosed as having hepatic metastases or normal livers, histologic examination of the liver was performed within 2 months of hepatic scintigraphy and scintiangiography; in 10 of these patients, radiopaque arteriography was also performed. Of the 92 patients studied, 23 had histologically normal livers, 10 had hepatomas, and 59 were classified as having hepatic metastases. In all 10 patients with hepatoma, the scintiangiographic and histologic observations agreed; 9 of these patients had a "tumor stain." Scintiangiograms in 51 of the patients with metastases also showed a tumor stain, and in 2 of the metastasis patients, scintiangiography revealed tumor vascularity where the scintigraphic results were normal. In 2 of 4 patients with metastases and 2 of 6 patients with hepatomas, scintiangiograms revealed tumor stain which was not evident on radiopaque arteriography. In 20 of the patients with normal hepatic tissue, both the hepatic scintigram and corresponding scintiangiogram were normal, while in 2 others both were abnormal; in 1 other patient, the scintigram was normal, but the scintiangiogram demonstrated focal arterialization due to a renal carcinoma. The results indicate that: a normal scintigram with a corresponding normal scintiangiogram make neoplastic involvement of the liver improbable; a normal scintigram and a tumor stain on the scintiangiogram of a patient with a known primary neoplasm outside the liver is suggestive of hepatic metastases; and neoplastic arterialization or tumor stain is more readily detected by scintiangiography than by radiopaque arteriography. Dynamic hepatic scintiangiography is a simple technique which should be included in the evaluation of the liver for neoplastic involvement.

5631 ABRASIVE CYTOLOGY OF THE PANCREATIC AND BILIARY DUCT IN MAN.

(E.) Weidenhiller, S.; Fluegel, H.; Rosch, W. (Dep. Med., Univ. Erlangen-Nuremberg, Germany). *Endoscopy* 7(2):72-74, 1975.

Abrasive cytological examination of the pancreatic and biliary duct was evaluated as a technique for the preoperative diagnosis of malignant tumors of the pancreas and biliary tree. A specially designed Fogarthy-catheter was run through a conventional endoscopic retrograde cholangiopancreatography tube and introduced into Vater's papilla in 25 patients; after positioning, the abrasion balloon at the tip of the catheter was inflated and withdrawn. Using this probe, abraded cell material was obtained from the pancreatic duct in 19 patients and from the common bile duct in 6 patients. Sufficient cytological material was obtained in almost all patients without noticeable complications. In 1 patient in whom a previous retrograde pancreatogram was suspicious of pancreatic carcinoma, the diagnosis was cytologically confirmed prior to surgery. The abrasion balloon technique described will probably be of value in the cytological examination of the common bile and pancreatic ducts, and will be particularly useful in cases of suspicious strictures or complete obstruction of the ductal system by malignancy.

5632 DIAGNOSTIC VALUE OF SERUM BILE ACID ESTIMATIONS IN LIVER DISEASE.

(E.) Barnes, S.; Gallo, G. A.; Trash, D. B.; Morris, J. S. (R. Free Hosp., London, England). *J. Clin. Pathol.* 28(6):506-509, 1975.

Fasting and postprandial serum bile acid concentrations were measured in normal (10 men and 8 women, aged 23-35 yr) subjects and in patients (18 men and 12 women, aged 25-65 yr) with a variety of hepatobiliary diseases. The 30 patients were histologically diagnosed as follows: cryptogenic cirrhosis (9), alcoholic cirrhosis (3), primary biliary cirrhosis (6), active chronic hepatitis (4), cholestatic syndromes (drug jaundice) (3), viral hepatitis (2), and large bile duct obstruction (3). In addition, 7 persons (5 men and 2 women, aged 18-75 yr) with hepatovenous outflow block (3) and unconjugated hyperbilirubinemia (4) were studied. In normal subjects the serum bile acid concentration ranged between 0 and 15 μM/liter. No differences were noted between the sexes or between fasting and postprandial concentrations. In 27 of the 30 patients with hepatobiliary disease, fasting concentrations were above the normal range (22-600 μM/liter). In 3 subjects with liver disease the fasting serum bile acid concentrations were normal, but 2 hr after the fatty breakfast they became markedly elevated. In 2 of these 3 subjects, other biochemical estimations (serum bilirubin, aspartate transaminase, alkaline phosphatase) were normal. Compared with the other biochemical estimations the postprandial serum bile acid concentrations were the only estimations which were consistently abnormal. In the 4 patients with unconjugated hyperbilirubinemia, both fasting and 2 hr postprandial bile acid concentrations were normal as were the liver function tests, which was expected as they had no histological liver disease. Two of the 3 with hepatic venous outflow block had normal fasting concentrations, but all had elevated postprandial serum bile acid concentrations, indicating a degree of hepatocellular dysfunction. This study shows that the 2-hr postprandial serum bile acid concentrations are elevated in patients with histological hepatobiliary disease, even when fasting concentrations and other liver function tests are normal. Despite the obvious value of serum bile acids in indicating the presence of histological liver damage, the results indicate that such measurements are of no value in distinguishing between particular liver diseases, particularly in deciding whether cholestasis is of intra- or extrahepatic origin.

5633 THE USE OF A SHORT-LIVED RADIONUCLIDE IN THE INVESTIGATION OF ACUTE BLEEDING IN THE UPPER GASTROINTESTINAL TRACT.

(E.) Pettersson, C.; Forssman, O.; Hollender, A.; Mulder, J. L. (Cent. Hosp., Boras and Ferring AB, Malmo, Sweden). *Scand. J. Gastroenterol.* 10:213-215, 1975.

The possibility of detecting and monitoring bleeding in the upper gastrointestinal tract using a short-lived radionuclide ^{113}In^{m} was investigated. *In vitro* studies were performed to confirm the protein binding of indium ions. *In vivo* studies in 2 healthy subjects showed that when the radionuclide was ingested in 0.04 M HCl, no absorption took place. The radionuclide was passed along the gastrointestinal tract and no significant binding to the stomach or the duodenum could be detected. The procedure was then studied in 28 patients with acute bleeding in the upper gastrointestinal tract. In 16 patients no signs of blood could be detected from aspirates from the duodenum or stomach. In another 4 cases, only traces of blood could be found. In the remaining 8 cases, the aspirate showed a +++ Weber reaction. In 11 cases with a positive, and in 1 case with a negative, test for blood in the aspirate, ^{113}In^{m} was injected i.v. In no patient was a higher radioactive count found in the aspirates than in controls. In all patients, tests for blood in the feces remained positive for 2 weeks or less. Current bleeding was noted in only 1 patient as judged by the injection of ^{113}In^{m}. By using this radionuclide to estimate the amount of current bleeding in the gastrointestinal tract, bleeding in the amount of 8-10 ml/hr can be detected, providing a complete collection of the contents of the gastrointestinal lumen can be performed. As the radionuclide is short-lived it can be used repeatedly in the same patient. The most striking finding of this study was that in patients with acute bleeding in the upper gastrointestinal tract but without signs of shock, the bleeding mostly ceases within a very short time after onset. Therefore, the blood in aspirates from the duodenum or stomach is obviously mostly of somewhat older origin. If bleeding is monitored by this present method, it might be possible for a patient to leave the hospital long before a negative blood test in the feces is obtained.

5634 TECHNETIUM-99m-PYRIDOXYLIDENEGLUTAMATE: A NEW HEPATOBILIARY RADIOPHARMACEUTICAL. II. CLINICAL ASPECTS.

(E.) Ronai, P. M.; Baker, R. J.; Bellen, J. C.; Collins, P. J.; Anderson, P. J.; Lander, H. (Inst. Med. Vet. Sci., R. Adelaide Hosp., South Australia). *J. Nucl. Med.* 16(8):728-737, 1975.

The new radiopharmaceutical, Technetium-99m-pyridoxylideneglutamate (^{99m}Tc-PG), was clinically evaluated in ten control subjects, 24 patients referred for the investigation of right upper quadrant abdominal pain, and 36 patients referred for investigation of jaundice. No patient preparation or premedication was used prior to the i.v. administration of 5 to 6 mCi of the compound. Sequential scintigrams were recorded for all patients, and contrast radiologic studies of the biliary tree were performed as indicated. There were no subjective symptoms or biochemical changes associated with the administration of the radiopharmaceutical. In the control subjects, the biliary tree and gallbladder were seen within 10 to 15 min of injection and within 20 min marked accumulation of radioactivity was noted in the gallbladder and gastrointestinal tract; the ^{99m}Tc-PG-cholescintigrams were normal in seven controls and the gallbladder was not visualized in the remaining three. Gallbaldder disease was present in 13 of the patients referred for investigation of right upper quadrant pain. All seven patients with acute cholecystitis and one out of four patients with chronic cholecystitis had nonvisualization of the gallbladder, whereas five patients with chronic cholecystitis and/or cholesterolosis had normal cholescintigrams; in the first group, nonvisualization of the gallbladder was also reported on the contrast studies. Cholescintigraphy was greatly inferior to contrast radiologic studies in the detection of gallbladder stones. Diagnosis of complete extrahepatic biliary obstruction was correctly made by the cholescintigram in all 11 cases in which it occurred, whereas correct diagnosis based on the cholescintigram was made in only seven out of 14 patients with incomplete extrahepatic biliary obstruction. A diagnosis of obstruction due to malignancy was correctly made in eight out of ten patients by means of a scintigraphic equivalent to Courvoisier's sign. A nonspecific pattern, consistent with incomplete biliary obstruction or hepatocellular disease, was observed on the cholescintigram in all 11 patients with hepatocellular disease. It is suggested that the ^{99m}Tc-PG-cholescintigram be used in conjunction with contrast radiologic studies in the preoperative investigation of patients with possible surgical disease of the biliary tract; the former is more appropriate in the patient with jaundice while the latter is more appropriate in the nonjaundiced patient.

5635 AN EXPERIMENTAL STUDY OF ^{99m}Tc PERTECHNETATE ABDOMINAL SCANS IN JEJUNAL INTUSSUSCEPTION: PRELIMINARY RESULTS. *(E.)* James, A. E., Jr.; Strecker, E. P.; Miller, F. J., Jr.; Bush, M. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *J. Surg. Res.* 19(1):71-76, 1975.

The abnormalities noted on ^{99m}Tc pertechnetate abdominal scans of dogs with small bowel intussusceptions were studied. Surgical, nonreducible small bowel intussusceptions were produced in eight mongrels. At various intervals thereafter, ^{99m}Tc pertechnetate (75 µCi/kg) was administered i.v. and abdominal scans were obtained 30 min, 4 hr, and 24 hr later using a rectilinear scanner. Scans were also obtained on normal controls receiving ^{99m}Tc pertechnetate for other diagnostic studies. The animals were sacrificed 12, 24, or 48 hr after injection, the small bowel was removed, and radiographs were made. Samples of the intraluminal fluid and tissue samples were counted in a well counter and histological preparations were made. A characteristic abnormal image was seldom obtained on the abdominal scans, and even in animals giving positive results, the bowel proximal to the intussusception, not the intussusception itself, was visualized. In addition, the major concentration of radioactivity was in the intraluminal fluid proximal to the surgically-induced intussusception. Selective concentration of the radiopharmaceutical was also observed just proximal to a variety of surgically-created mechanical obstructions of the jejunum and ileum. The scans on normal dogs showed accumulation of radioactivity in the stomach and urinary bladder as well as occasional visualization in the region of the duodenum. Despite catheterization, the urinary bladder was often visualized. The results suggest that the abdominal scan abnormalities in patients with intussusception are not caused by visualization of the lesion but are due to attendant bowel obstruction.

5636 TOMOECHOGRAPHIC DIAGNOSIS OF HEPATIC POLYCYSTOSES. *(Fr.)* Weill, F.; Aucant, D.; Becker, J. C.; Eisenscher, A.; Kraehenbuhl, J. R. (Univ. Hosp. Cent., Besancon, France). *(Ann. Radiol. (Paris)* 17(7):685-689, 1974.

Tomoechography is considered an excellent tool in the diagnosis of hepatic polycystosis due to the specific character of the ultrasonic image of lesions containing echo-free zones. Six cases of hepatic polycystosis (all women) were detected in over 4000 ultrasonic examinations. In four of the patients with discrete hepatomegaly and no palpable cystic formation, hepatic polycystosis was detected by additional ultrasonic examination following the diagnosis of renal polycystosis. In the two other patients, who exhibited marked hepatomegaly, renal polycystosis was discovered secondarily. The association of renal polycystosis is evidently an important positive clue in the diagnosis of hepatic polycystosis.

5637 EXPERIMENTAL AND CLINICAL STUDIES WITH ^{131}I-BSP. *(Ger.)* Mostbeck, A.; Peschl, L.; Rettenbacher-Taubner, H.; Neumayr, A. (Wilhelmine Hosp., Vienna, Austria). *Z. Gastroenterol.* 12(7):547-556, 1974.

In vitro and *in vivo* studies demonstrated that by using ^{131}I-BSP with a high specific activity, it is possible to reduce the dose of BSP from 5 mg/kg to less than 1 mg and thus to reduce the likelihood of untoward reactions to the dye. *In vitro* studies revealed that ^{131}I-BSP had the same R_f value as inactive BSP on thin-layer chromatography, was chemically stable, and was bound almost quantitatively to serum proteins when they were precipitated with trichloroacetic or sulfosalicylic acids. In *in vivo* studies, there was a good correlation between clearance constants for the first 10 to 12 min and the 45:3-min retention values obtained with both forms of BSP. However, ^{131}I-BSP was excreted somewhat more slowly by the liver. The clearance constant was reduced by about 50% when ^{131}I-BSP and inactive BSP were administered simultaneously. When instilled into the duodenum, only 0.4 to 0.6% of ^{131}I-BSP was later detected in the blood. Although very small quantities of ^{131}I-BSP were found in the thyroid (maximum of 3-5% of the i.v. administered dose after 24 hr), iodine should be administered to block the thyroid. Good correlations were found between clearance constants and 45:3-min retention values obtained from blood samples and those obtained by measurement of radioactivity over the skull. However, the use of radiation measurements gave consistently smaller clearance constants and significantly higher retention values than were obtained with inactive BSP. These differences are attributed to the distribution of radioactive BSP between vascular and extravascular space. A comparison of clearance constants determined with ^{131}I-BSP on 198 patients (91 with no evidence of liver disease, the rest with fatty liver, acute and chronic hepatitis, compensated and decompensated cirrhosis, obstructive jaundice and intrahepatic cholestasis) gave good separation between normal subjects and those with liver diseases other than fatty liver. Of 30 histologically confirmed cases of fatty liver, only six had pathological values. All patients tolerated i.v. injections of ^{131}I-BSP, and no reactions occurred when the test was repeated after an interval of several days to several weeks.

5638 FUNCTIONAL EXAMINATION OF DEFECATION IN CHILDREN. *(Ger.)* Berger, D.; Landry, M. (Lausanne Univ. Clin., Switzerland). *Fortschr. Geb. Roentgenstr. Nuklearmed.* 121(4):428-434, 1974.

Kinematographic studies of the anorectal canal were performed during defecation on 11 children, aged 6 weeks to 10 yr, using video tape recording and image intensification. In some cases, electromyograms (EMG) were obtained from the puborectal loop and the external anal sphincter to differentiate between myogenic and neurogenic disorders. In constipated children, both under basal conditions and during defecation, anorectal angles were smaller than normal; the anal canal contracted only slightly and was generally conical in shape. The sphincter zone sometimes appeared spastic. In several constipated children, basal activity on the EMG was increased, but no pathognomonic significance was attributed to this finding. In Hirschsprung's disease involving the rectum, changes found in constipated children were more pronounced and were accompanied by dyskinesia in the aganglionic part of the large intestine. In a 10-yr-old boy who developed neurogenic constipation and spastic paresis on the right as the result of a lumbosacral fracture, both the external urethral sphincter and the anorectal region showed spastic changes because both sphincters were innervated by the sacral nerve. Classical anatomical features were totally absent in a 8-yr-old girl with meningomyelocele: the anorectal angle could not be measured, the anal canal was wide open and defecation had to be aided by abdominal pressure. An EMG of the external anal sphincter was almost a straight line. In children with high anorectal malformations, no matter what the clinical findings, the anorectal angle was smaller than in normal children and there was a certain rigidity and inactivity of the anal canal. These radiological measurements gave a rather accurate picture of the quality of continence.

5639 THE PANCREATOGRAPHIC EFFECT DURING PHARMACOANGIOGRAPHY OF THE PANCREAS. *(E.)* Schmarsow, R.; Peters, P. E. (Deutsche Klink Diagnostik, Wiesbaden, Germany). *Acta Radiol.* [*Diagn.*] *(Stockh.)* 16(1):73-80, 1975.

The value of pancreatography in distinguishing between chronic pancreatitis and carcinoma of the pancreas was investigated. Secretin (1.5 IU/kg), priscoline (0.7 mg/kg), serotonin (0.7 γ/kg), and caerulein (0.3 γ/kg) were used to enhance the pancreatographic effect. Seventy examinations were performed in 55 adult patients with possible pancreatic disorders. In a series of 174 celiac angiographies performed without drugs, the pancreatographic effect was present in 18.4%. In the 55 angiographies performed with drugs, the effect was produced in 74.5%. By injecting the contrast medium into the hepatic and splenic arteries and in a few cases into the gastroduodenal and dorsal pancreatic arteries without drugs increased the frequency of the pancreatographic effect to 43.3% (out of 30 cases). The use of drugs increased it further to 71.4% (out of 28 cases). With the addition of vasodilatory drugs, higher rates of pancreatographic effect were achieved. In 31 cases the type of pancreatographic effect was compared to pancreatic function. A homogeneous pancreatographic effect was achieved in 14 patients with normal pancreatic function. In six cases with a pathologic test, the pancreas appeared mottled. No correlation between scanning with the isotope ^{75}Se-methionin and the pancreatographic effect was found. The few cases of malignancy in this study material suggest that the pancreatographic effect is completely or partially absent in carcinoma patients. A homogeneous pancreatographic effect seems to exclude a carcinoma and a mottled effect indicates chronic pancreatitis. The absence of pancreatographic effect in carcinoma may be due to the fact that the neoplasm is mostly hypovascular and that the neoplastic tissue has an almost homogeneous dense fibrous stroma, which impedes the accumulation of the contrast medium in this region.

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5644 COMPRESSION METHOD ON PERCUTANEOUS TRANSHEPATIC CHOLANGIOGRAPHY. *(Jpn.)* Nimura, Y.; Hichino, S.; Sato, T.; Kamiya, T.; Ieda, H.; Hayakawa, N.; Nakae, Y.; Kondo, T.; Matsuno, T.; Enomoto, I. (Yachiyo Hosp. Aichi Prefecture, Japan). *Rinsho Hoshasen* 19(12):933-941, 1974.

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5646 ENDOSCOPIC PANCREATGOCHOLANGIOGRAPHY IN THE DIAGNOSIS OF DISEASES OF THE PANCREAS AND BILIARY DUCTS. *(Rus.)* Tofan, A. V.; Demin, M. D.; Temin, V. T.; Shalimov, S. A.; Chernyi, V. A.; Shpontak, A. S. (Dept. Oncol., Kiev Inst. Postgrad. Training Phys., USSR). *Klin. Khir.* (3):12-17, 1975.

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5672 SMALL INTESTINAL BIOPSY IN THE DIAGNOSIS OF INTESTINAL AND NON-INTESTINAL DISEASES. *(Sp.)* Cantor, D. S.; Costa, J. A. (Prof. Alejandro Posadas Polyclin., Haedo, Argentina). *Acta Gastroenterol. Latinoam.* 6(2):73-81, 1974.

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5681 THE TECHNIQUE AND EVALUATION OF SECRETIN AND PANCREOZYMIN TESTS FOR EXOCRINE PANCREAS. *(Rus.)* Geller, L. I.; Kazimirchik, A. P.; Romanets, V. A.; Bulgakova, O. S. (Khabarovsk Med. Inst., USSR). *Lab. Delo* (4):214-218, 1975.

5682 THE USE OF RHEOHEPATOGRAPHY IN THE DIAGNOSIS OF LIVER PATHOLOGY. *(Rus.)* Reznik, N. D.; Vaisman, V. D. (Gorki Inst. Labour Hyg. Occupat. Diseases, USSR). *Ter. Arkh.* 46(12):111-114, 1974.

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5684 INTRAOPERATIVE ESOPHAGOSCOPY, GASTROSCOPY, COLONOSCOPY, AND ENDOSCOPY OF THE SMALL BOWEL. *(E.)* Bombeck, C. T. (Abraham Lincoln Sch. Med., Chicago, Ill.). *Surg. Clin. North Am.* 55(1):135-142, 1975.

5685 CLINICAL SIGNIFICANCE OF GASTRIN RADIOIMMUNOASSAY. *(E.)* Walsh, J. H. (Dep. Med., Univ. California, Los Angeles). *Semin. Nucl. Med.* 5(3):247-254, 1975.

5686 THE VALUE OF THE DUODENAL INTUBATION METHOD (SELLINK MODIFICATION) FOR THE RADIOLOGICAL VISUALIZATION OF THE SMALL BOWEL. *(E.)* Fleckenstein, P.; Pedersen, G. (Rigshosp., Univ. Copenhagen, Denmark). *Scand. J. Gastroenterol.* 10(4):423-425, 1975.

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5688 ASSOCIATION OF AN ISOMERIC SPECIES OF CARCINOEMBRYONIC ANTIGEN WITH NEOPLASIA OF THE GASTROINTESTINAL TRACT. *(E.)* Edgington, T. S.; Astarita, R. W.; Plow, E. F. (Scripps Clin. Res. Found., La Jolla, Calif.). *New Engl. J. Med.* 293(3):103-107, 1975.

5689 RADIOLOGIC DIAGNOSIS OF PANCREATIC CANCER. *(E.)* Rosch, J. (Univ. Oregon Med. Sch., Portland). *J. Surg. Oncol.* 7(2):121-123, 1975.

5690 SECRETION ANALYSIS: SECRETIN TESTING IN PANCREATIC CANCER. *(E.)* Dreiling, D. A. (Mt. Sinai Sch. Med., New York, N.Y.). *J. Surg. Oncol.* 7(2):101-105, 1975.

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5692 ENDOSCOPIC EXAMINATION OF THE COLON AND RECTUM. *(E.)* Stearns, M. W. (Mem. Hosp. Cancer, New York, N.Y.). *S. Afr. Cancer Bull.* 19(1):28-31, 1975.

5693 RETROGRADE ENDOSCOPIC CHOLANGIO-PANCREATICOGRAPHY (ERCP). *(E.)* Myren, J. (Ulleval Hosp., Oslo, Norway). *Scand. J. Gastroenterol.* 10(3):229-230, 1975.

5694 LAPAROSCOPIC DIAGNOSIS OF THE CRUVEILHIER-BAUMGARTEN SYNDROME. COMMENTS ON THREE CASES, TWO OF THEM OCCULT. *(Sp.)* Herrerias, J. M.; Perez Mijares, R.; Marcias, A.; Jimenez, J.; Damiano, A.; Esteban, J.; Aljama, P.; Moreno, M. (Prof. Sch. Dig. Tract Dis., Cadiz, Spain). *Rev. Esp. Enferm. Appar. Dig.* 45(4):409-416, 1975.

5695 ENDOSCOPIC EVALUATION OF THE GASTRIC ANTRUM. *(E.)* Mann, N. S. (VA Hosp., Topeka, Kansas). *South. Med. J.* 68(5):541-542, 1975.

5696 THE RADIOLOGICAL DIAGNOSIS OF HEPATOMA WITH SPECIAL EMPHASIS ON ANGIOGRAPHY. *(E.)* Bass, E. M. (Groote Schuur Hosp., Cape Town, South Africa). *S. Afr. Med. J.* 49(18):745-751, 1975.

5697 FIBEROPTIC ENDOSCOPY: PRECISE DEFINITION OF UPPER GASTROINTESTINAL DISEASE. *(E.)* Knutson, C. O. (Univ. Louisville Sch. Med., Ky.). *Am. J. Surg.* 129(6):651-655, 1975.

5698 COLONOSCOPY: A REVIEW. *(E.)* Overholt, B. F. (St. Mary's Mem. Hosp., Knoxville, Tenn.). *Gastroenterology* 68(5):1308-1320, 1975.

5699 ANALYSIS OF LIVER SCANNING IN A GENERAL HOSPITAL. *(E.)* Oster, Z. H.; Larson, S. M.; Strauss, H. W.; Wagner, Jr., H. N. (Johns Hopkins Med. Inst., Baltimore, Md.). *J. Nucl. Med.* 16(6):450-453, 1975.

5700 BILE CANALICULAR ANTIBODIES IN NON-HEPATIC DISEASES. *(E.)* Diederichsen, H. (Univ. Hosp., Odense, Denmark). *Lancet* (7916):1142-1143, 1975.

5701 STUDIES ON PERCUTANEOUS TRANSHEPATIC CHOLANGIOGRAPHY: A SAFE AND EFFECTIVE TECHNIQUE BY LATERAL APPROACH. *(E.)* Lin, J. S. (Kumamoto Univ. Med. Sch., Japan). *Kumamoto Med. J.* 27(1):27-40, 1974.

5702 ECHOGRAPHIC STUDY OF THE PANCREAS. *(E.)* Leopold, G. R. (Univ. California, Sch. Med., San Diego). *JAMA* 232(3):287-289, 1975.

See also, 5705, 5726, 5890, 5920, 5931, 5937, 5966, 6006, 6024, 6047, 6076, 6083, 6118, 6166, 6181, 6183, 6210, 6224, 6263, 6350, 6362, 6368, 6375, 6383, 6392, 6398, 6434.

GASTROINTESTINAL DISEASES

ESOPHAGUS

5703 THE EPIDEMIOLOGY OF ESOPHAGEAL CANCER IN NORTH CHINA AND PRELIMINARY RESULTS IN THE INVESTIGATION OF ITS ETIOLOGICAL FACTORS. *(E.)*

Anonymous. *Sci. Sinica* 18(1):131-148, 1975.

An epidemiological survey (involving 50 million people) of the incidence of esophageal cancer in North China was carried out from 1969 to 1971. Preliminary clinical and experimental studies were also carried out on etiological factors and associated conditions, and pathogenesis and histopathology of esophageal cancer. An area with a high mortality rate from esophageal cancer was located in the southern Taihang Mountains on the borders of the Honan, Shansi and Hopei provinces. The mortality rates decreased gradually, extending out from this area in irregular, concentric belts. The highest age-sex adjusted mortality rate reached 139.80/100,000 and the lowest was 1.43/100,000, with an average mortality rate of 37.39/100,000. The male:female patient ratio averaged 1.6:1. The higher the mortality rate of a locality, the lower the difference in the sex ratio. Over 60% of the total rate was in the age group ranging from 50 to 69 yr. In counties with a high incidence of esophageal cancer, there were also greater numbers of people with epithelial dysplasia of the esophagus. The average age-sex adjusted incidence rate in Lingsien county (1959-1970) was 108.56/100,000, and the mortality rate was 99.76/100,000. Mortality rate trends showed little change over 30 yr. The ratio of esophageal cancer to cancer of the gastric cardia was 3:1; most cases were located in the middle and lower third of the esophagus. A comparative study showed that in areas of high esophageal cancer incidence, gullet cancer among chickens was also common. It is concluded that there must be a close relation between this disease and the geographical environment.

5704 BENIGN EPITHELIAL HYPERPLASIA OF THE ESOPHAGUS: GLYCOGENIC ACANTHOSIS. *(E.)*

Clemencon, G.; Gloor, F. (Canton Hosp., Olten, Switzerland). *Endoscopy* 6(4):214-217, 1974.

The epidemiology, morphology, and localization of glycogenic acanthosis of the esophagus in humans is discussed. Among 364 esophagogastroscopies performed between July 1973 and March 1974, glycogenic acanthosis of the esophagus was diagnosed in 24 patients (19 men and 5 women, average age, 64 yr). Fifteen of these patients had endoscopic signs of an incompetent cardia and 11 of these had clear endoscopic signs of reflux esophagitis. Biopsy specimens from 12 patients showed focal areas of thickened squamous epithelium with an increased number of rounded glycogen-rich squamous cells. There was no cellular atypia or dyskeratosis and no signs of inflammation. The lesions in glycogenic acanthosis consist of small, mostly multiple whitish plaques of raised hyperplastic epithelium; they are usually found on folds and can be stained dark brown or violet with Lugol's solution. Glycogenic acanthosis is often mistaken for leukoplakia on macroscopic examination, especially when the plaques are relatively large. The small plaques are missed on esophagoscopy when the lumen is not optimally distended by air insufflation or when using a very bright light. It is concluded that glycogenic acanthosis is a very frequent but harmless condition; although nothing is known of its etiology, it seems to be more frequent in cardiac incompetence.

5705 BARRETT'S ESOPHAGUS AND ADENOCARCINOMA.

(Fr.) Savary, M.; Naef, A. P.; Ozzello, L.; Roethlisberger, B. (Otorhinolaryngol. Clin., Univ. Lausanne, Switzerland). *Schweiz. Med. Wochenschr.* 105(18):575-579, 1975.

Endoscopy was used to demonstrate various forms of cylindrical epithelial heterotopia with respect to frequency, pathological associations and relationship with adenocarcinoma. Of 6168 esophagoscopies performed between 1963 and 1974 (more than half for gastroesophaegeal reflux syndrome), 164 revealed the presence of single or multiple cylindrical epithelial zones. These zones were of two distinct types: 1) cylindrical epithelial islets of the upper (19%) or lower (4%) esophagus; 2) widespread and diffuse cylindrical eipthelial heterotopia of the lower esophagus (77%). The first type was a malformation of congenital origin without pathological significance. The second type, however, would seem to enter into the category of chronic peptic esophagitis and may represent a form of epithelial cicatrization of chronic peptic ulcers. It is concluded that adenocarcinoma (15%) of the lower esophagus is associated with the second type of cylindrical epithelial heterotopia. Treatment of peptic esophagitis is advisable before it reaches the chronic stage and, in particular, before the appearance of cylindrical epithelial zones.

5706 PATHOGENESIS AND TREATMENT OF REFLUX ESOPHAGITIS.

(It.) Basile, A. (1st. Gen. Clin. Chir., Univ. Catania, Italy). *Chir. Gastroenterol.* 8(3):251-263, 1974.

5707 ACHALASIA OF CARDIA TREATED BY DILATATION.

(Ger.) Sanatger, R.; Braun, L. (Chir. Clin., Univ. Munster, Germany). *Med. Klin.* 69(41):1667-1671, 1974.

5708 STRANGULATED HIATAL HERNIA AND ITS TREATMENT WITH A CRINOPLATE.

(Fr.) Lacaze, J. (no affil.). *Bordeaux Med.* 7(17):2555-2558, 1974.

5709 CANCER OF THE ESOPHAGUS AND GASTRIC CARDIA: DIAGNOSTIC PROBLEMS.

(Fr.) Savary, M. (Otorhinolaryngblog. Clin., Univ. Lausanne, Switzerland). *Schweiz. Med. Wocheschr.* 105(18):550-555, 1975.

5710 MORPHOLOGICAL CHANGES OF ESOPHAGUS CANCER AFTER PREOPERATIVE RADIATION THERAPY. *(Rus.)* Gosh, T. E.; Pirogov, A. I.; Gritsman, Y. Y.; Papliyan, N. P.; Mamontov, A. S.; Konnova, L. V. (P. A. Gertsen Moscow Sci. Res. Inst. Oncol., USSR). *Med. Radiol. (Mosk.)* 19(7):21-26, 1974.

5711 EFFECT OF ANGIOARCHITECTURE OF THE SMALL INTESTINE ON CREATION OF AN ARTIFICIAL ESOPHAGUS. *(Rus.)* Dmitrienko, V. V.; Shraer, T. I. (Kemerovo Med. Inst., USSR). *Khirurgiia (Mosk.)* (12):66-71, 1974.

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5713 INDICATIONS AND LIMITS OF PRESSURE STUDIES IN THE EXPLORATION OF THE GASTRO-OESOPHAGEAL JUNCTION. *(It.)* Rovere, G. Q. D.; Farello, G. A.; Fracastoro, G.; Motton, G.; Perbellini, A.; Cordiano, C. (1st. Patol. Spec. Chir., Univ. Padova, Italy). *Acta Chir. Ital.* 30(3):253-271, 1974.

5714 OESOPHAGEAL STENOSIS FROM REFLUX. *(It.)* Rovere, G. Q. D.; Farello, G. A.; Motton, G.; Fracastoro, G.; Palma, F. D.; Corhiano, C. (1st. Patol. Spec. Chir., Univ. Padova, Italy). *Acta Chir. Ital.* 30(2):99-121, 1974.

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5716 SPONTANEOUS PNEUMOESOPHAGOGRAM. *(Ger.)* Dittrich, J. K.; Bautz, B. (Univ. Child. Clin., Marburg, Germany). *Fortschr. Rontgenstr.* 121(4):417-423, 1974.

5717 PRIMARY ADENOCARCINOMA OF THE ESOPHAGUS ARISING IN A COLUMNAR-LINED ESOPHAGUS. *(E.)* Stillman, A. E.; Selwyn, J. I. (Tucson Med. Cent., Ariz.). *Am. J. Dig. Dis.* 20(6):577-582, 1975.

5718 ESOPHAGEAL RECONSTRUCTION: AN EXPERIMENTAL APPROACH TO THE CONTROL OF REFLUX AFTER ESOPHAGEAL RESECTION. *(E.)* Henderson, R. D.; Fung, K.; Dube, P.; Marryatt, G. (Toronto Gen. Hosp., Canada). *Can. J. Surg.* 18(2):165-171, 1975.

5719 CONGENITAL ATRESIA OF THE OESOPHAGUS. A FOLLOW-UP STUDY IN 36 SURGICALLY CORRECTED CASES. *(E.)* Vaage, S.; Levorstad, K.; Efskind, L. (Univ. Hosp., Oslo, Norway). *Scand. J. Thorac. Cardiovasc. Surg.* 9(1):68-74, 1975.

5720 COLON ESOPHAGEAL BYPASS. *(E.)* Wilkins, Jr., E. W.; Burke, J. F. (Harvard Med. Sch., Boston, Mass.). *Am. J. Surg.* 129(4):394-400, 1975.

5721 REOPERATION AFTER ESOPHAGOMYOTOMY FOR ACHALASIA OF THE ESOPHAGUS. *(E.)* Ellis, Jr., F. H.; Gibb, S. P. (Lahey Clin. Found., Boston, Mass.). *Am. J. Surg.* 129(4):407-412, 1975.

5722 A RADIOLOGICAL STUDY OF 63 CASES OF OPERATED ESOPHAGEAL ATRESIA. *(E.)* Meradji, M.; Van Walleghem, J.; Vervat, D. (Sophia Child. Hosp., Rotterdam, Netherlands). *Radiol. Clin. Biol.* 43(6):559-570, 1974.

5723 ACQUISITION OF COLUMNAR (BARRETT TYPE) EPITHELIUM IN THE DISTAL ESOPHAGUS AFTER PARTIAL ESOPHAGOGASTRECTOMY. *(E.)* Hamilton, S. R.; Yardley, J. J. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Lab. Invest.* 32(3):425-426, 1975.

5724 OESOPHAGEAL ATRESIA IN THE SOUTH WEST OF ENGLAND. *(E.)* David, T. J.; O'Callaghan, S. E. (Bristol Gen. Hosp., England). *J. Med. Genet.* 12(1):1-11, 1975.

5725 EVALUATION OF THE NISSEN FUNDOPLICATION FOR TREATMENT OF HIATAL HERNIA: USE OF PARIETAL CELL VAGOTOMY WITHOUT DRAINAGE AS AN ADJUNCTIVE PROCEDURE. *(E.)* Bahadorzadeh, K.; Jordan, P. H. (Baylor Coll. Med., Houston, Texas). *Ann. Surg.* 181(4):402-408, 1975.

5726 BOERHAAVE SYNDROME: REPORT OF A CASE TREATED NON-OPERATIVELY. *(E.)* Larrieu, A. J.; Kieffer, R. (Univ. Md. Hosp., Baltimore). *Ann. Surg.* 181(4):452-454, 1975.

5727 CANCER OF THE OESOPHAGUS IN BRITTANY: AN INCIDENCE STUDY IN ILLE-ET-VILAINE. *(E.)* Tuyns, A. J.; Masse, G. (Int. Agency Res. Cancer, Lyon, France). *Int. J. Epidemiol.* 4(1):55-59, 1975.

5728 LOWER-ESOPHAGEAL WEBS. *(E.)* Tedesco, F. J.; Morton, W. J. (Washington Univ. Sch. Med., St. Louis, Mo.). *Am. J. Dig. Dis.* 20(4):381-383, 1975.

5729 SLIDING ESOPHAGEAL HIATUS HERNIA AND REFLUX PEPTIC ESOPHAGITIS. *(E.)* Woodward, E. R. (Dep. Surg., Univ. Fla., Gainesville). *Proc. Inst. Med. Chic.* 30(5):160-164, 1974.

5730 RADICAL SURGICAL TREATMENT OF ESOPHAGEAL STENOSIS DUE TO EPIDERMOLYSIS BULLOSA. *(E.)* Kralik, J.; Rapant, V. (Munic. Hosp., Olomouc, Czechoslovakia). *J. Thorac. Cardiovasc. Surg.* 69(5):790-792, 1975.

5731 PRIMARY ADENOID CYSTIC CARCINOMA OF THE ESOPHAGUS. REPORT OF A CASE AND REVIEW OF THE LITERATURE. *(E.)* Pourzand, A.; Freant, L.; Levin, R.; Peabody, J.; Absolon, K. (Washington Hosp. Cent., D.C.). *J. Thorac. Cardiovasc. Surg.* 69(5):785-789, 1975.

5732 DOUBLE PRIMARY MALIGNANT LESION OF THE OESOPHAGUS--A CASE REPORT. *(E.)* Suri, R. K.; Singh, H.; Jain, S.; Gujral, J. S. (Post-Grad. Inst. Med. Educ. Res., Chandigarh, India). *Indian J. Cancer* 11(4):444-447, 1974.

5733 RADIOGRAPHIC FINDINGS IN ESOPHAGEAL ATRESIA WITH PROXIMAL POUCH FISTULA (TYPE B). *(E.)* Berdon, W. E.; Baker, D. H. (Dep. Radiol., Babies Hosp., New York, N.Y.). *Pediatr. Radiol.* 3(2):70-74, 1975.

See also, 5288, 5649, 5650, 5802, 5985, 6336, 6348, 6522, 6547.

STOMACH

5734 EFFECT OF UNILATERAL THORACIC VAGOTOMY ON HISTAMINE-STIMULATED ACID SECRETION IN MAN. *(E.)* Basso, N.; Coloni, G. F.; Ricci, C.; Passaro, Jr., E.; Speranza, V. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *J. Surg. Res.* 18(6):555-558, 1975.

The acid response to histamine stimulation in patients undergoing a thoracotomy for lung carcinoma was studied to determine the effect of unilateral vagotomy in man. Male thoracotomy patients (56, aged 37-62 yr) were studied pre- and postoperatively. There were five groups of patients: 1) vagus resection not necessary (32 patients); 2) vagotomy in the right diaphragm (five); 3) vagotomy at the right pulmonary hilum (five); 4) vagotomy at the left diaphragm (eight); and 5) vagotomy at the left pulmonary hilum (six). In all cases the acid response to a maximal dose of histamine (0.024 mg/kg) was measured before and after thoracotomy. The effect of unilateral vagotomy on gastric acid secretion depended on whether the right or left nerve was cut, and at what level the cut occurred. Resection of the left vagus at the level of the diaphragm reduced basal secretion and diminished acid response to histamine stimulation by 22%. No significant reduction in acid secretion was observed when vagal resection was done at the pulmonary hilum. Resection of the right vagus reduced basal secretion and the acid response to histamine stimulation by 45-50% when performed at either the pulmonary hilum or the diaphragm. These results may correlate with the observation that in man the right vagus is generally greater in size than the left. It is suggested that the right vagus is responsible for the major portion of the vagal innervation of the parietal cell mass and/or overlaps the innervation to the mucosa supplied by the left nerve. It is further concluded that unilateral right vagotomy in man may have therapeutic implications.

5735 METASTATIC INVOLVEMENT OF THE STOMACH SECONDARY TO BREAST CARCINOMA. *(E.)* Joffe, N. (Beth Israel Hosp., Boston, Mass.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(3):512-521, 1975.

Roentgenologic findings associated with gastric metastases secondary to breast carcinoma (based on nine such cases) are presented, including case reports of five of these women (51 to 81 yr). Autopsy in the first case revealed disseminated breast carcinoma with gross infiltration of the wall of the stomach (predominantly the muscularis) and submucosa by tumor cells identical to those seen in the primary breast lesions. Histological examination in the third case showed tumor infiltration of the serosa, muscularis and submucosa, with marked infiltration in the subserosal region of the stomach. An upper gastrointestinal examination in the fourth case revealed at least two large ulcer craters in the region of the narrowed prepyloric segment; however, no autopsy was obtained. Biopsy of the gastric mass in the fifth case revealed anaplastic carcinoma similar in appearance to the primary breast tumor. Based on the gross pathologic findings, two main types of roentgenologic abnormalities might be expected to occur: circumscribed nodular lesions or more diffuse, infiltrative lesions. The commonest type of roentgen abnormality was that produced by diffuse intramural infiltration of the stomach resulting in a linitis plastica appearance, with narrowing of the lumen secondary to gross thickening of the gastric wall, rigidity and diminished or absent peristalsis in the involved area. Roentgenologic studies of the second type of lesion may show single or multiple discrete intraluminal filling defects with or without associated ulceration. Because of the apparent rarity of this lesion, and until more information is available concerning the incidence of the discrete nodular form of gastric metastases from breast carcinoma, it is concluded that final diagnosis must depend upon histologic confirmation even in patients with disseminated disease.

5736 HISTOLOGIC TYPES AND POSSIBLE INITIAL STAGES IN EARLY GASTRIC CARCINOMA. *(E.)* Grundmann, E. (Inst. Pathol., Univ. Munster, Germany). *Beitr. Pathol.* 154(3):256-280, 1975.

In order to determine 1) which histologic types are found in early gastric cancer, 2) whether possible precursor and initial characteristic stages exist, and 3) from which proliferative zones these arise, 2003 gastric specimens from 301 patients were examined, and a diagnosis of carcinoma was made in 45 cases. Examination of resection preparations revealed 36 cases of deep invasive stomach carcinoma and nine of early gastric cancer confined to mucosa and/or submucosa. Carcinomatous proliferations limited to mucosa or submucosa were classified in three histologic types: intestinal (adeno); mucocellular (signet ring cell); and anaplastic (solid). Mixed types were found combining the first and second, or the second and third types; one case presented a mixture of all three. Possible precursor or initial stages of all three types were found in a further 31 biopsies. Some were glandular lesions in superficial parts of the mucosa, previously described as possible preneoplastic stages of the intestinal type of early gastric cancer. "Signet ring cell drippings" from lower parts of tubule necks were recorded as an initial form of the signet ring cell type; this process is interpreted as detaching of isolated signet ring cells from a gland neck zone in progressing atypical transformation. An early neoplastic stage of the anaplastic type was identified in the gland neck dysplasia located exclusively in the antrum between surface mucosa and antrum glands, appearing rich in cells, and stretched. Early gastric cancer of this third type will arise in the same location. Conclusions from formal histogenesis suggest that the signet ring cell type and the anaplastic (solid) type might start in the lower part of the tubule necks. In consequence, the neck region of gastric glands could be the critical field of malignant transformation in gastric mucosa. It is concluded that long-term follow-up studies are needed to verify these observations and their interpretations.

5737 SURGICAL MANAGEMENT OF MENETRIER'S DISEASE WITH PROTEIN-LOSING GASTROPATHY. *(E.)*

Scott, Jr., H. W.; Shull, H. J.; Law, IV, D. H.; Burko, H.; Page, D. L. (Vanderbilt Univ. Med. Cent., Nashville, Tenn.). *Ann. Surg.* 181(5):765-777, 1975.

Case histories for three patients with Menetrier's disease and protein-losing gastropathy who were studied during a 12-yr period are presented. Characteristic findings which differentiate these patients from individuals with hypertrophic hypersecretory gastropathy, including the Zollinger-Ellison syndrome, were: 1) hypertrophy of gastric mucosa with giant rugal folds involving the fundus, cardia and body of the stomach but not the antrum; 2) mucosal hypertrophy consisting of gastric mucus-secreting cells while parietal and chief cells were diminished in number and were absent from many microscopic sections; 3) gastric secretion of large volume containing excess mucus, low to absent hydrochloric acid and protein concentrations five or six times the normal (1.7 mg/ml); 4) hypoalbuminemia and hypoglobulinemia due to loss of serum proteins from gastric mucosa into the gastric lumen; 5) rare association with gastric ulcer. Unlike patients with the Zollinger-Ellison syndrome, none of these had duodenal ulcer or multiple endocrine adenomatosis. Menetrier's disease with protein-losing gastropathy is a potentially lethal disorder of unknown cause and no specific treatment, although resection of the site of protein losses can be effective. One of the three patients presented here died before gastrectomy could be performed. The other two have remained well for 11 months and 12 yr, resp., after total gastrectomy with Roux-en-Y esophagojejunostomy and Hunt-Lawrence jejunal pouch. Because the manifestations of the disease have disappeared in these patients, and good rehabilitative results have been obtained, these procedures are recommended for patients with Menetrier's disease.

5738 THE EFFECT OF METOCLOPRAMIDE ON HUMAN GASTRIC EMPTYING AND SECRETION. *(E.)*

Meeroff, J. C. (Mayo Clin., Rochester, Minn.). *Acta Gastroenterol. Latinoam.* 6(2):55-61, 1974.

The effects of metoclopramide on gastric acid secretion and the rate of gastric emptying in normal subjects and duodenal ulcer patients were studied. Metoclopramide (10, 20, and 40 mg) was injected i.v. into 30 normal subjects, 30 duodenal ulcer patients with intact stomachs, and 30 duodenal ulcer patients who had undergone truncal vagotomy and pyloroplasty; in some cases histamine phosphate (0.04 mg/kg) was injected s.c. simultaneously with the metoclopramide. The effects on basal acid output, histamine-augmented acid output, the rate of gastric emptying of an isotonic saline "test meal" (500 ml infused into the stomach *via* gastric tube), and serum gastrin concentration were determined. Metoclopramide had no effect on basal output or histamine-stimulated acid output in the normal controls or duodenal ulcer patients. Although it significantly increased the rate of gastric emptying in the controls and duodenal ulcer patients who had undergone truncal vagotomy and pyloroplasty, metoclopramide had no effect on acid secretion or serum gastrin. The effects on gastric emptying were significantly greater with 40 mg metoclopramide than with 10 mg. In doses of 10-20 mg, metoclopramide had no side effects, but 40 mg caused mild to moderate watery diarrhea, abdominal spasms, and, in 60% of the patients, drowsiness. The results indicate that in humans metoclopramide increases the rate of gastric emptying in both intact and vagotomized stomachs, that this effect is not related to the release of gastrin, that the mechanism of action is independent of the integrity of the vagus nerves, and that metoclopramide has no effect on gastric acid secretion.

5739 BLOOD SEROTONIN AND GLUCOSE LEVELS IN PATIENTS WITH DUMPING SYNDROME AFTER ORAL LOADING WITH 100 ML OF 50% GLUCOSE. *(Pol.)*

Schabowski, J.; Pokora, J. (Inst. Intern. Dis., Med. Acad., Lublin, Poland). *Pol. Tyg. Lek.* 30(4):141-144, 1975.

In 24 patients with dumping syndrome (19 men and 5 women, aged 21-67 yr) blood serotonin and glucose levels, blood pressure and pulse rate were determined in the fasting state, and also 15 min, 30 min, and 1-5 hr after p.o. administration of 50% glucose. A control group of 9 patients (aged 32-62 yr) without dumping syndrome was subjected to similar treatment. All subjects in both groups had previously undergone partial gastrectomy. Four different types of behavior with regard to blood serotonin and glucose levels were observed in patients with dumping syndrome: 11 patients (first type) showed a rise in serotonin concentration after the first 15 min with a considerable rise in glucose level followed by secondary hypoglycemia after 2-3 hr; 4 patients (second type) showed a rise in serotonin level after administration of glucose, while no significant changes occurred in the level of glucose; 5 patients (third type) showed a very high rise in glucose level followed by hypoglycemia after 2-3 hr, but without serotonin changes; and 4 patients (fourth type) showed no significant changes in serotonin and glucose levels as was also observed in controls.

5740 ROENTGENO-ENDOSCOPIC COMPARISONS IN DETERMINING THE PROXIMAL BOUNDARY OF CANCER OF THE STOMACH. *(Rus.)* Marmorshtein, S. Y.; Shnirelman, A. I.; Rozanov, Y. L.; Savinkin, Y. N. (P. A. Gertsen Moscow Sci. Res. Inst. Oncol., USSR). *Sov. Med.* (9):92-97, 1974.

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See also, 5260, 5299, 5316, 5615, 5617, 5618, 5619, 5641, 5651, 5659, 5660, 5661, 5675, 5695, 5711, 5835, 5927, 5948, 5954, 6030, 6154, 6358, 6442, 6476, 6484, 6542.

STOMACH

Peptic Ulcers

5799 ELECTRICAL POTENTIAL DIFFERENCE, SODIUM ABSORPTION AND POTASSIUM SECRETION BY THE HUMAN RECTUM DURING CARBENOXOLONE THERAPY. *(E.)* Tomkins, A. M.; Edmonds, C. J. (Univ. Coll. Hosp., London, England). *Gut* 16(4):277-284, 1975.

The transmucosal electrical potential difference and sodium and potassium net fluxes were measured in patients on carbenoxolone therapy for peptic ulcer, and were compared to measurements in normal individuals. Of nine patients (aged 19-65 yr), six had gastric ulcer and three had duodenal ulcer; eight of these had no clinical evidence of disease. Each patient was studied before, during and after a 6-week course of carbenoxolone sodium (100 mg three times/day for 1 week, followed by 50 mg three times/day for 5 weeks). The ninth patient, a 62-yr-old man with gastric ulcer, developed fluid retention while on the drug, but remained in the experiment while in the hospital. Potential difference was measured with probe and skin electrodes. Flux measurements were obtained with dialysis tubes mounted on rubber catheters and containing 1.6 ml solution. There was a rise in transmucosal potential difference persisting throughout treatment in all subjects, accompanied by an increase in sodium absorption and potassium secretion. Comparison of the potential difference changes produced by carbenoxolone with those due to the mineralocorticoid 9-α-fluorocortisol (taken by the two controls) showed that carbenoxolone had about 0.001% the potency on a weight basis, and the two drugs appeared to be additive in their effects. Topical instillation of carbenoxolone produced an elevation of potential difference which persisted for 3 days. Amiloride and bendrofluazide did not interfere with these actions of carbenoxolone, but spironolactone abolished them. The patient with fluid retention and hypokalemia had a rectal potential difference similar to that of the other patients who had no side effects. It is concluded that carbenoxolone consistently produces mineralocorticoid activity in the rectal mucosa of all individuals taking the drug, and that this may reflect an inherent property of the drug.

5800 THE EFFECT OF INTRAVENOUS INFUSIONS OF PROSTAGLANDINS E_2 AND $F_{2\alpha}$ ON HUMAN GASTRIC FUNCTION. *(E.)* Newman, A.; de Moraes-Filho, J. P. P.; Philippakos, D.; Misiewicz, J. J. (Cent. Middlesex Hosp., London, England). *Gut* 16(4):272-276, 1975.

The effect of i.v. infusions of prostaglandins E_2 and $F_{2\alpha}$ at various dose levels on basal or on maximally or submaximally pentagastrin-stimulated acid secretion was studied in 40 male subjects with peptic ulcer, x-ray negative dyspepsia, or no gastrointestinal disease. Each received a continuous i.v. infusion of either 0.15 M saline, pentagastrin or prostaglandins. Prostaglandin $F_{2\alpha}$ (0.08 µg/kg/min) transiently, but significantly, inhibited submaximal acid output and increased the frequency of antral contractions. Prostaglandin E_2 (0.08 µg/kg/min) inhibited basal acid secretion. It is concluded that the inhibition of acid secretion by prostaglandin $F_{2\alpha}$ is of interest in emphasizing the species differences in responses to this agent. Further, additional studies of antral contractibility in individuals with more active antral contractions are indicated, since in these persons, only infrequent contractions were observed in the basal state, averaging 1/min.

5801 THE EFFECT OF DIAZEPAM ON PENTAGASTRIN-STIMULATED AND NOCTURNAL (SLEEPING) GASTRIC SECRETION IN MAN. *(E.)* Roberts, D. M.; Oldrey, T. B. N. (R. Army Med. Coll., London, England). *Am. J. Gastroenterol.* 63(5):396-399, 1975.

The effects of diazepam on stimulated gastric secretion and on unstimulated nocturnal secretion during sleep were studied in 10 male patients with dyspepsia (six with duodenal ulcer). Gastric secretion was measured for 3 hr following an s.c. injection of pentagastrin (6 µg/kg), an i.v. injection of diazepam (10 mg), and/or an i.v. injection of atropine (1.2 mg). Gastric secretion was also measured for 7 hr during confirmed nocturnal sleep that was preceded in some cases by an i.v. injection of diazepam (10 mg). The mean acid output after pentagastrin alone was 25.96, 13.00, and 5.61 mM HCl in the 1st, 2nd, and 3rd hr, resp. The addition of diazepam to pentagastrin resulted in a significant reduction in acid output during the 2nd (52.6% reduction) and 3rd (75.0% reduction) hr. The further addition of atropine resulted in a further reduction of 31.4% in the 1st hr, 42.0% in the 2nd hr, and 76.4% in the 3rd hr. The effects of diazepam and atropine on the pentagastrin-induced volume output were similar. The mean unstimulated nocturnal acid secretion over 7 hr was 24.83 mM HCl and the mean volume output was 338 ml. Diazepam did not significantly alter these parameters. The results suggest that diazepam acts during wakefulness by inhibiting secretory stimuli arising centrally, thus providing a rationale for use of this drug in patients with peptic ulcer in whom stress may be a pathogenic factor.

5802 GASTRO-OESOPHAGEAL REFLUX COMPLICATING HIGHLY SELECTIVE VAGOTOMY. *(E.)* Temple, J. G.; McFarland, J. (R. South. Hosp., Liverpool, England). *Br. Med. J.* 2(5964):168-169, 1975.

Patients with chronic duodenal ulceration and no evidence of pyloric stenosis, gastroesophageal reflux, or hiatus hernia underwent highly selective vagotomy. Of 20 patients, five (three men and two women, aged 41-56 yr) developed persistent symptoms of gastroesophageal reflux, with the usual features of heartburn, retrosternal discomfort and regurgitation accompanied by increased flatulence. This complication developed shortly after surgery in three patients and between 6 and 12 months in the remaining two. Postoperative barium meal examination showed gastroesophageal reflux in four patients, with evidence of hiatus hernia in three. All these patients showed normal gastric emptying after the barium meal. All required constant medication for their discomfort and all were classified as grade III on the Visick scale. The insulin test was positive in four of these patients. It is suggested that as a result of the greater mobilization of the stomach which is necessary in highly selective vagotomy, a degree of gravitational dependence develops which may alter slightly the angle of entry of the esophagus into the stomach. Since making the observations in these five cases, a practice has been instituted of narrowing the angle of His by opposing the stomach to the esophagus with a continuous chromic catgut stitch run up for about 5 cm from the esophagogastric junction. This simple procedure may readily be added when small vagal fibers are being cleared from the area.

5803 EFFECT OF THERAPEUTIC DOSES OF ULTRASOUND ON VASCULAR PERMEABILITY OF THE GASTRIC MUSOSA IN PATIENTS WITH PEPTIC ULCERS. *(Rus.)* Nikitin, G. A. (Smolensk Med. Inst., USSR). *Sov. Med.* (2):53-56, 1975.

5804 EFFECT OF SELECTIVE PROXIMAL VAGOTOMY WITH AND WITHOUT PYLOROPLASTY UPON BASAL AND FOOD STIMULATED SERUM IMMUNOREACTIVE GASTRIN IN PATIENTS WITH DUODENAL ULCER. *(Ger.)* Bauer, H.; Arnold, R.; Track, N. S.; Creutzfeldt, W.; Holle, F. (Med. Univ. Gottingen, Germany). *Klin. Wochenschr.* 53(5):209-214, 1975.

5805 THERAPY OF GASTRIC AND DUODENAL ULCERS. CLINICAL-STATISTICAL INVESTIGATION ON THE USE OF A NEW DRUG: SULPHOGLYCOPEPTIDE. *(It.)* Fazzini, G.; Giampaglia, G.; Scarpulla, P. (Civil Hosp., Padua, Italy). *Minerva Chir.* 29(17):933-935, 1974.

5806 EXOCRINE PANCREATIC FUNCTION IN PEPTIC ULCER PATIENTS LONG AFTER GASTRECTOMY. *(Rus.)* Zinevich, V. P. (Leningrad Inst. Grad. Med. Studies, USSR). *Vestn. Khir.* 114(2):31-34, 1975.

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5808 ETIOPATHOGENESIS OF PEPTIC ULCER. *(Ser.)* Zhivanovich, M.; Svirchevich, A.; Vukovich, V. (Novi Sad Hosp., Yugoslavia). *Med. Pregl.* 27(7-8):321-330, 1974.

5809 THE CLINICAL SIGNIFICANCE OF EXAMINATION OF GASTRIC SECRETION BY MAXIMAL STIMULATION WITH HISTAMINE IN PATIENTS WITH DUODENAL ULCER. *(Cz.)* Jablonska, M.; Fucik, M.; Souckova, E.; Prazak, J. (Fac. Gen. Med., Charles Univ., Prague, Czechoslovakia). *Vnitr. Lek.* 20(3):241-250, 1974.

5810 GASTROINTESTINAL BLEEDING AFTER GASTRECTOMY FOR PEPTIC ULCER. *(Rus.)* Abushakhmanov, Kh. A. (Karaganda Med. Inst., USSR). *Vestn. Khir.* 114(1):126-130, 1975.

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5852 PATHOGENESIS AND AETIOLOGY OF ULCER DISEASE. PART II: DUODENAL ULCER. *(E.)* Blum, A. L.; Peter, P.; Krejs, G. J. (Med. Clin., Stadtspitals Triemli, Zurich, Switzerland). *Acta Hepatogastroenterol.* 22(2):123-218, 1975.

5853 EMERGENCY VAGOTOMY WITH A DRAINAGE PROCEDURE FOR PERFORATED GASTRIC AND DUODENAL ULCER: STUDY OF 73 CASES. *(E.)* Vardoulis, J.; Stenos, J.; Avgoustis, A.; Lefkidis, C. (Gen. Hosp., Volos, Greece). *Int. Surg.* 60(4):226-228, 1975.

5854 A PATTERN OF SERUM AMYLASE CONCENTRATION IN THE INITIAL 24 HOURS AFTER PERFORATION OF DUODENAL ULCERS. *(E.)* Imrie, C. W.; Whyte, A. S.; Frew, E. M. S. (R. Infirm., Glasgow, Scotland). *J. R. Coll. Surg. Edinb.* 19(6):370-373, 1974.

5855 THE EFFECT OF PYLOROPLASTY ON THE SIZE OF GASTRIC OUTLET. *(E.)* Taylor, T. V.; Hegarty, M. M.; Davies, M.; Torrance, H. B. (R. Infirm., Manchester, England). *J. R. Coll. Surg. Edinb.)* 19(5):292-296, 1974.

5856 MANAGEMENT OF THE RECURRENT ULCER. *(E.)* Lindenauer, S. M.; Dent, T. L. (Dep. Surg., Univ. Mich., Ann Arbor). *Arch. Surg.* 110(5):531-536, 1975.

5857 ACUTE PERFORATED DUODENAL ULCER. AN EVALUATION OF SURGICAL MANAGEMENT. *(E.)* Sawyers, J. L.; Herrington, Jr., J. L.; Mulherin, Jr., J. L.; Whitehead, W. A.; Mody, B.; Marsh, J. (Vanderbilt Univ. Sch. Med., Nashville, Tenn.). *Arch. Surg.* 110(5):527-530, 1975.

5858 GASTRIC ULCER CONTROLLED TRIAL USING A LICORICE DERIVATIVE RUCEDAL. *(E.)* Scobie, B. A. (Wellington Hosp., N.Z.). *N.Z. Med. J.* 81(536):298-299, 1975.

5859 THE CAUSE AND TREATMENT OF POSTVAGOTOMY DIARRHOEA. *(E.)* Condon, J. R.; Robinson, V.; Suleman, M. I.; Fan, V. S.; McKeown, M. D. (St. Mary's Hosp., Eastbourne, England). *Br. J. Surg.* 62(4):309-312, 1975.

See also, 5216, 5314, 5617, 5742, 5875, 6048, 6521.

5860 MECKEL'S DIVERTICULUM. SHOULD IT BE EXCISED INCIDENTALLY AT OPERATION? *(E.)* Michas, C. A.; Cohen, S. E.; Wolfman, Jr., E. F. (Dep. Surg., Univ. California, Davis). *Am. J. Surg.* 129(6):682-685, 1975.

During a 7-yr period, 35 cases of Meckel's diverticulum were recorded, 33 discovered at operation and two at autopsy. Of the 33 found at operation, 21 were found incidentally during surgery for other diseases, and 12 represented the primary source of the signs or symptoms for which celiotomy was performed. In the series presented here, there were 18 males and 17 females (aged 7 weeks to 77 yr), with the highest incidence during the second decade. Of 12 patients with signs or symptoms resulting from complications of a Meckel's diverticulum, four presented with hemochezia varying from passage of bright red blood to passage of tarry feces. Gastric mucosa was present in the diverticulum in three of these patients, and ileal mucosa was found in the fourth. Abdominal pain was the primary symptom in four other patients, each of whom was found to have acute Meckel's diverticulitis, with or without perforation. The remaining four had small bowel obstruction secondary to either intussusception or an adhesive band. Of the 33 diverticula, 31 were removed at operation. There were no operative deaths. The major complications reported in the literature for Meckel's diverticulum are hemorrhage, obstruction, inflammation, and benign and malignant neoplasia. Hemorrhage is most frequent in children, while inflammation is most common in adults. Because complications of a Meckel's diverticulum occur in 15-33% of cases and invariably require operative treatment, and because when signs or symptoms arise, morbidity and mortality are high, it is suggested that incidental Meckel's diverticulectomy be performed at any age when the morbidity and mortality of the primary procedure will not thus be substantially increased.

5861 ANTIPERISTALTIC ILEAL SEGMENT IN THE PREVENTION OF ILEOSTOMY DIARRHEA. *(E.)* Cohen, S. E.; Matolo, N. M.; Michas, C. A.; Wolfman, Jr., E. F. (Univ. California Sch. Med., Davis). *Arch. Surg.* 110(7):829-832, 1975.

An antiperistaltic segment was created in 5 of 10 ileostomized dogs to investigate its value in prevention of ileostomy diarrhea. All 10 had the terminal part of the ileum divided about 5 cm from the ileocecal valve, the distal end oversown, and the proximal end exteriorized. In 5 dogs a 4-cm antiperistaltic ileal segment was placed 30.5 cm proximal to the ileostomy. The antiperistaltic segments were removed after 3 weeks, and the intestinal continuity restored. Daily preoperative (5 days) and postoperative determinations were made of body weight and serum and urine electrolyte values (sodium and potassium). Ileostomy drainage was also calculated. Following surgery, the dogs given the ileostomy only lost about 20% of their body weight, and serum sodium decreased by 12-30 mEq/liter. Potassium remained normal. All 5 died between 2-9 days postoperatively of massive water and electrolyte imbalance. The dogs given ileostomy and an antiperistaltic segment lost less than 10% of their body weight, and serum sodium remained normal. The stools became nonwatery, and roentgenography showed greatly prolonged transit time (2 hr 45 min) in contrast to the controls (50 min). After removal of the antiperistaltic segment, the dogs lost an additional 10-15% of their body weight, serum sodium level showed a mean decrease of 15 mEq/liter, and transit time shortened to one hr and 15 min. Two of the 5 subsequently died of water and electrolyte imbalance. It is concluded that inclusion of an antiperistaltic segment can successfully control ileostomy diarrhea.

5862 SMALL-BOWEL OBSTRUCTION SECONDARY TO ENDOMETRIOSIS. *(E.)* Martimbeau, P. W.; Pratt, J. H.; Gaffey, T. A. (Mayo Grad. Sch. Med., Univ. Minn., Rochester). *Mayo Clin. Proc.* 50(5):239-243, 1975.

A review of Mayo Clinic records (1950-1970) disclosed 11 cases of intestinal obstruction due to endometriosis of the small bowel. The endometriosis involved the ileum in all 11 cases and was not found proximal to the ileum in any case; it was necessary to resect a portion of the small intestine in all cases. The ileal endometriosis was restricted to the serosa and the muscular coats, and the obstruction was due to fibrosis and kinking of the bowel. Because the symptoms are not acute or specific, the diagnosis is seldom established prior to laparotomy. If pelvic endometriosis is minimal, intestinal resection is adequate; but if the pelvic lesions are extensive, or if multiple sites in the intestines are involved, then more radical resection and bilateral oophorectomy are indicated.

5863 INTRALUMINAL DUODENAL DIVERTICULUM: REPORT OF TWO CASES AND REVIEW OF THE LITERATURE. *(E.)* Fleming, C. R.; Newcomer, A. D.; Stephens, D. H.; Carlson, H. C. (Mayo Grad. Sch. Med., Univ. Minn., Rochester). *Mayo Clin. Proc.* 50(5):244-248, 1975.

Because of the rarity of intraluminal duodenal diverticulum, 2 cases are presented along with a review of the literature on the subject. In both cases described, a roentgenogram of the upper gastrointestinal tract showed an intraluminal duodenal diverticulum in the 2nd portion of the duodenum. As of 1972, there were approximately 33 reported cases of intraluminal duodenal diverticulum; 29 of the 33 patients were adults. Most patients presented with abdominal pain and obstructive symptoms; gastrointestinal bleeding had occurred in 25%. Barium study showed a characteristic radiolucent halo that represented the wall of the diverticulum. It is suggested that surgery be approached with caution because of possible injury to the papilla, and in children, coexisting congenital anomalies may be present; in general, surgical intervention should be reserved for patients who have severe, persisting symptoms.

5864 GALLSTONE ILEUS: REVIEW OF THE LITERATURE AND PRESENTATION OF THIRTY-FOUR CASES.

(E.) Day, E. A.; Marks, C. (Louisiana State Univ. Sch. Med., New Orleans). *Am. J. Surg.* 129(5):552-558, 1975.

An analysis of 34 patients (31 women and 3 men, aged 37-93 yr) with gallstone ileus is presented with a review of the literature on the subject. A history of biliary disease was present in 13 of the 34 patients. Surgical treatment was carried out in 32 patients, with an operative mortality of 19%; enterotomy alone had a mortality of 14%. Only 3 of 32 patients who underwent operation had recurrent symptoms of biliary disease. Two patients in the series of 34 developed carcinoma of the gallbladder. All 3 patients who underwent one-stage cholecystectomy, fistula repair, and enterotomy survived. Those 3 cases added to 23 previously reported offer validity to one-stage repair in dealing with the entire disease process during one operative procedure, thus eliminating the high morbidity after enterotomy alone.

5865 LUMENAL AND MEMBRANE HYDROLYSIS OF STARCH IN SOME DISEASES OF THE SMALL INTESTINE AND PANCREAS.

(E.) Masevitch, C. H.; Ugolev, A. M.; Zabelinskii, E. K.; Kisily, N. P. (Leningrad Med. Inst. Hyg. Sanit., USSR). *Am. J. Gastroenterol.* 63(4):299-306, 1975.

α-Amylase and γ-amylase levels were determined in a study of lumenal and membrane hydrolysis of starch. A total of 143 subjects were studied: 28 normal; 24 with nontropical sprue; 81 with chronic proximal enteritis; 10 with chronic pancreatitis. Mucosal samples of small intestine were aspirated and prepared for both morphological and enzymatic studies. A dependence was observed between the characteristics of the membrane hydrolysis of starch and the degree of morphological disturbances of the intestinal mucosa. The maximal decrease of the binding properties of the intestinal epithelium and γ-amylase of homogenate was found in subtotal atrophy of mucosa. In chronic jejunitis without atrophy the degree of disturbance of the membrane hydrolysis was minimal. An intermediate degree of disturbance was observed in partial atrophy of mucosa. In patients with chronic pancreatitis, α-amylase activity in the lumen of jejunum decreased 75-80%. The characteristics of the membrane digestion of starch were correlated with the morphological pattern of mucosa; the degree of lumenal hydrolysis of starch was approximately normal, with the exception of a decrease in 6 patients. The results suggest that the lumenal and membrane hydrolysis form an integrated system within the limits of which mutual compensation of deficiencies is possible.

5866 VITAMIN B_{12} ABSORPTION IN PATIENTS WITH CONTINENT ILEOSTOMY.

(E.) Jagenburg, R.; Kock, N. G.; Philipson, B. (Sahlgrenska Hosp., Goteborg, Sweden). *Scand. J. Gastroenterol.* 16(1):141-144, 1975.

Vitamin B_{12} absorption was studied in 16 men and 18 women 10 months to 6 yr after construction of a continent ileostomy. The mean age of the patients at the time of study was 33 yr, and none had been treated with vitamin B_{12}, folate, or iron after the operation. Schilling test values, serum vitamin B_{12}, serum folate, serum iron, total iron binding, capacity (TIBC) and hemoglobin were measured in all patients; in 3 patients, the local absorption of vitamin B_{12} from the ileal reservoir was measured. Normal Schilling test values were obtained in 21 patients after a single determination, and repeated tests showed a normal B_{12} absorption in 8 of the 13 patients in whom the Schilling test values were initially below 10%. In the remaining 5 patients, repeated Schilling tests showed borderline values (5-10%) in 4 cases and a low value (mean 4.5%) in 1 case. One of the patients with borderline values had previously undergone resection of 80 cm of the terminal ileum. In all but 1 patient, the serum iron, TIBC, serum folate, and whole blood folate levels were normal. When radioactive vitamin B_{12} and intrinsic factor were instilled directly into the ileal reservoir, the recovery of radioactivity in the 24-hr urine samples varied from 1.6-6.9%, indicating that the vitamin was absorbed by the mucous membrane of the reservoir. The construction of a continent ileostomy reservoir does not, therefore, appear to expose the patient to an increased risk of developing vitamin B_{12} malabsorption.

5867 MUCOSAL MORPHOLOGY, BACTERIOLOGY, AND ABSORPTION IN INTRA-ABDOMINAL ILEOSTOMY RESERVOIR.

(E.) Philipson, B.; Brandberg, A.; Jagenbrug, R.; Kock, N. G.; Lager, I.; Ahren, C. (Sahlgrenska Hosp., Goteborg, Sweden). *Scand. J. Gastroenterol.* 16(1):145-153, 1975.

The mucosal morphology, microbial flora, and absorption from continent ileostomy reservoirs were studied in 6 patients provided with such reservoirs after undergoing proctocolectomy because of ulcerative colitis. The studies were performed 1-12 months and 2 yr after construction of the reservoir. Biopsies of the reservoir mucosa were examined by light and electron microscopy; serial dilutions of the reservoir contents were incubated with appropriate media under aerobic and anaerobic conditions; and the absorption of directly instilled test solution (containing L-phenyl-alanine, D-xylose, and phenolsulfonaphthalein) from the reservoir was measured. The results indicated that the mucous membrane of the terminal ileal segment used for construction of the reservoir underwent morphological changes characterized by an increased cell turnover and shortening of the villi; these changes were noted within 1 month after the operation, and there was no evidence for a continuously progressing process. The brush border was intact in all specimens and no cellular lesions were discovered. The number of microorganisms/g of reservoir contents varied between 10^4 and 10^{8-9}. In 19 of the 26 samples the anaerobes outnumbered the aerobes, and in 5 specimens, equal numbers of aerobes and anaerobes were found. *Escherichia coli* and *Streptococcus faecalis* were isolated from all samples, and lactobacilli, bacteroides, and *Clostridium perfringens* were isolated at least once from 5 of the 6 patients. In spite of the new microbial ecology and morphological changes, the reservoir mucous membrane did not retain an absorptive capacity for D-xylose and phenylalanine.

5868 TRUE VILLOUS ADENOMA OF THE JEJUNUM. *(E.)* Delevett, A. F.; Cuello, R. (Bridgeport Hosp., Conn.). *Gastroenterology* 69(1):217-219, 1975.

A 73-yr-old female presented with intermittent abdominal pain, anorexia, weight loss, and a positive stool hematest. An intraluminal defect in the middle portion of the ascending colon was noted. At operation, a fungating tumor in the ascending colon was found. A portion of terminal ileum, the cecum, and ascending colon was resected and an ileotransverse colostomy was performed. Pathological study showed an adenocarcinoma of the colon with negative regional nodes. Fifteen months later the patient experienced five attacks of constant midabdominal pain and vomited large quantities of greenish fluid which relieved the attacks. Examination revealed intussusception of the jejunum and a tumor mass at the distal end of the intussuscepting bowel. Operation revealed no evidence of recurrent tumor. On opening the jejunum, a soft, thickened, markedly hypertrophic mucosa with definite demarcation from the normal bowel was noted. Part of the jejunum was resected. Studies showed the tumor to be a hyperplastic proliferating adenomatous lesion with a villous pattern, consisting of tall columnar epithelium suspended in long cords of loosely arranged fibrous connective tissue. There was no evidence of atypia or of infiltration of the underlying stroma. This patient demonstrated the typical gross and microscopic characteristics of a villous adenoma.

5869 SMALL INTESTINAL OBSTRUCTION WITH GENERALIZED DIVERTICULA OF THE GASTROINTESTINAL TRACT. *(Ger.)* Brunner, H.; Penner, E.; Kokoschke, R.; Eggerth, G.; Korn, P. (Dep. Gastroenterol. Med. Comput. Sci., Univ. Vienna, Austria). *Wien. Med. Wochenschr.* 125(18):290-292, 1975.

5870 RARE INTESTINAL TUMORS IN CHILDREN. *(Fr.)* Gout, J. P.; Lebranchu, Y.; Rossignol, A. M. (no affil.). *Med. Infant.* 81(5):511-524, 1974.

5871 MECKEL'S DIVERTICULUM IN CHILDREN. *(Fr.)* Rambaud, P.; Varloteaux, C. H.; Bessard, G. (no affil.). *Med. Infant.* 81(5):445-451, 1974.

5872 INTRALUMINAL DIVERTICULUM IN THE DUODENUM. *(Ger.)* Brijs, V. A. (St. Elisabeth Hosp., Heretals, Belgium). *Fortschr. Geb. Roentgenstr. Nuklearmed.* 122(2):171, 1975.

5873 GALLSTONE ILEUS. *(Rus.)* Izmailov, G. A.; Skvortsov, M. G.; Fattakhov, K. S. (Kazan Med. Inst., USSR). *Klin. Med.* 53(2):123-124, 1975.

5874 PECULIARITIES OF THE COURSE OF CHRONIC DUODENITIS IN CHILDHOOD. *(Rus.)* Apostolov, B. G.; Sokolova, M. I.; Paikov, V. L. (Dept. Infantile Dis., Leningrad Sanit.-Hyg. Med. Inst., USSR). *Vopr. Okhr. Materin. Det.* 20(3):19-23, 1975.

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5892 BACTERIAL PERITONITIS AND THE BURSTING STRENGTH OF INTESTINAL ANASTOMOSES. *(E.)* Kilam, S. K.; Jackson, F. L.; Williams, H. T. G. (Dep. Surg., Mem. Univ. Newfoundland, St. Johns). *Can. J. Surg.* 18(4):372-378, 1975.

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5897 THE ROLE OF FIBEROPTIC ENDOSCOPY IN THE DIAGNOSIS AND MANAGEMENT OF DUODENAL NEOPLASMS. *(E.)* Wald, A.; Milligan, F. D. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Am. J. Dig. Dis.* 20(6):499-505, 1975.

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5900 FURTHER CONSIDERATIONS IN USE OF JEJUNOILEAL BYPASS IN PATIENTS WITH MORBID OBESITY. *(E.)* Scott, Jr., H. W.; Dean, R. H. Shull, H. J.; Gluck, F. W.; Abram, H. S.; Webb, W.; Younger, R. K.; Brill, A. B. (Vanderbilt Univ. Med. Cent., Nashville, Tenn.). *Bull. Soc. Int. Chir.* 33(5-6):378-387, 1974.

See also, 5587, 5588, 5635, 5652, 5655, 5656, 5660, 5667, 5684, 5686, 5687, 5711, 5913, 5917, 5921, 5938, 6022, 6056, 6071, 6204, 6390, 6395, 6403, 6418, 6476, 6484, 6505, 6519, 6520, 6536, 6542, 6591, 6592.

SMALL INTESTINE

Malabsorption

5901 LEUKOCYTE REACTIVITY TO α-GLIADIN IN DERMATITIS HERPETIFORMIS AND ADULT COELIAC DISEASE. *(E.)* Allardyce, R. A.; Shearman, D. J. C. (Univ. Dep. Ther., Edinburgh, Scotland). *Int. Arch. Allergy Appl. Immunol.* 48(3):395-400, 1975.

The leukocyte adherence inhibition test was used to study leukocyte reactivity to α-gliadin in 20 patients with dermatitis herpetiformis, and in 11 patients with adult celiac disease. Sedimented peripheral blood leukocytes from patients and normal subjects were washed twice in Hepes-buffered essential medium containing Hank's salts, and incubated in plastic tubes with 100 μg of purified α-gliadin at a concentration of 2 x 10^7 cells/ml. Control preparations were incubated without antigen. Following incubation for 30 min at 37 C, the test and control cells from each individual were placed on opposite sides of duplicate non-mirrored surfaces. After further incubation for 1 hr at 37 C in a moist atmosphere, the cells were counted. The coverslips were removed, and the non-adherent cells were removed. After a drop of fresh medium was placed on the surface, the remaining adherent cells were counted. The percent adherence of cells from the controls and test slides of each surface was calculated, and the mean of duplicate readings was recorded. The percent inhibition of leukocyte adherence equals 100 times the mean test adherence over the mean control adherence. Leukocytes from both groups of patients showed a significant inhibition of leukocyte adherence. Possible cell-mediated reactivity to this fraction of gluten is suggested.

5902 THE UPTAKE OF VITAMIN B_{12} BY THE SEDIMENT OF JEJUNAL CONTENTS IN PATIENTS WITH THE BLIND-LOOP SYNDROME.

(E.) Schjonsby, H.; Hofstad, T. (Med. Dep. A, Gade Inst., Univ. Bergen, Norway). *Scand. J. Gastroenterol.* 10(3):305-309, 1975.

Whether the sediment of jejunal contents in patients with the blind-loop syndrome was able to take up intrinsic factor-bound vitamin B_{12}, and whether such uptake prevented the intestinal absorption of the vitamin, was studied. Following preincubation of intrinsic factor-bound $^{57}CoB_{12}$ with the jejunal sediments of six patients with the blind-loop syndrome, the mean uptake by the sediments of intrinsic factor-bound $^{57}CoB_{12}$ (28.1%) was significantly higher than the mean uptake by jejunal sediments from five control patients (5.8%). The uptake by the sediments significantly decreased when the incubations were carried out in the presence of lincomycin and neomycin. The jejunal sediments from the patients with the blind-loop syndrome inhibited the uptake of intrinsic factor-bound $^{57}CoB_{12}$ by perfused rat intestinal segments, whereas the sediments from controls had no such inhibitory effects. The results indicate that uptake by intestinal bacteria of intrinsic factor-bound vitamin B_{12} may contribute to the malabsorption of the vitamin in patients with the blind-loop syndrome, since the B_{12}-intrinsic factor complex is unavailable for intestinal absorption when it has been taken up by intestinal bacteria.

5903 MALABSORPTION AND PROTEIN-LOSING ENTEROPATHY IN A CHILD WITH X-LINKED AGAMMAGLOBULINEMIA.

(E.) Norman, M. E.; Hansell, J. R.; Holtzapple, P. G.; Parks, J. S.; Waldmann, T. A. (Child. Hosp. Philadelphia, Pennsylvania). *Clin. Immunol. Immunopathol.* 4(2):157-164, 1975.

A patient with infantile x-linked agammaglobulinemia was studied for malabsorption and protein-losing enteropathy. He first presented for hospitalization at 3 yr of age with severe hypogammaglobulinemia, a nonbloody diarrhea, vomiting, and arthralgia. Otitis media and sinusitis were present and treated with ampicillin. The patient showed failure to thrive over the next 30 months with intermittent diarrhea and anorexia. At 6 yr of age, diarrhea and weight loss became more severe despite gamma globulin therapy, but plasma therapy caused a temporary remission. At 7 1/2 yr, hypocalcemic tetany developed and malabsorption secondary to gluten enteropathy was diagnosed. Gluten-free diet caused a temporary remission. At 8 1/2 yr, radiography revealed thickening of the mucosal folds of the upper small bowel, and segmentation of the barium. Biopsy showed slightly flattened villi and inflammatory cells in the lamina propria. Functional hypoparathyroidism secondary to hypomagnesemia was later diagnosed, and magnesium therapy controlled the tetany. At 10 yr, an episode of severe hypoprothrombinemia occurred and the malabsorption syndrome was reevaluated. For protein metabolic studies, ^{51}Cr-albumin and ^{125}I-IgG were given i.v. at 14 and 13 μCi, resp., and 24 hr urine and stool collections were made from days 1-7. Immunologic studies involved measurement of immunoglobulins G, M, A and E and of CH50 hemolytic and C_3 complements. Delayed hypersensitivity skin tests were performed and an *in vitro* assay of cellular immunity was carried out. The labelled IgG had a half-life of 9.0 days and showed a fractional catabolic rate of 17.9%. Actual plasma loss was about 58.8 ml/day based on the ^{51}Cr-albumin, significantly higher than normal. Immunoglobulin levels wer markedly reduced (IgG: 48-100, IgA: 0-5, IgM: 0-9 mg/10 ml, and IgE: 4 ng/ml); C_3 complement was slightly reduc (86 mg/100 ml). Delayed hypersensitivity testing showe normal response to *Candida* antigen, implying intact cellular immunity. It is concluded that malabsorption and protein-losing enteropathy were both present in a child with infantile x-linked agammaglobulinemia, leading to marked abnormality in gamma globulin metabolism.

5904 PROTEIN-LOSING ENTEROPATHY AND MALABSORPTION IN ACUTE MEASLES ENTERITIS.

(E.) Dossetor, J. F. B.; Whittle, H. C. (Ahmadu Bello Univ. Hosp., Zaria, Nigeria). *Br. Med. J.* 2:592-593, 1975.

The association of measles and malnutrition was studied in 28 children with acute measles accompanied by diarrhea. Fecal protein loss, urine protein, and lactose tolerance were determined, and 1-hr blood xylose tests were performed. ^{59}Fe-labeled iron dextran (0.1 μCi/kg) was injected i.v.; all stools were collected for three days and plasma was sampled daily. Mean fecal ^{59}Fe-dextran clearance of 5 patients in the acute stage was 5.7% of plasma volume/day. After recovery, clearance fell to 1.49%. Absolute albumin loss was 1.68 g/day. Mean urine protein loss in 22 patients in the acute stage was 350 mg/liter, most of which was albumin. None showed urinary protein on recovery. Of 17 patients tested for lactose intolerance, 4 were intolerant. One died; the others were tolerant on retesting. Blood glucose rose more than 1.67 mM/liter in 11 and rose 1.11-1.67 mM/liter in 5. Two of the latter died.

In 1 patient, blood glucose did not rise during illness but rose 1.17 mM/liter on recovery. Xylose absorption tests showed a mean acute level of 0.93 mM/liter and a recovery level of 1.71. It is concluded that fecal protein loss and malabsorption may contribute significantly to malnutrition following measles.

5905 DERMATITIS HERPETIFORMIS AND SMALL INTESTINAL LESION - NO STRICT ASSOCIATION IN GERMAN PATIENTS.

(E.) Ruppin, H.; Weidner, F.; Domschke, S.; Domschke, W.; Classen, M.; Hornstein, O. P. (Dep. Med., Univ. Erlangen-Nurnberg, Germany). *Acta Hepatogastroenterol.* 22(2):105-111, 1975.

An investigation was conducted of morphological and functional characteristics of small intestinal mucosa in a group of 16 German patients with dermatitis herpetiformis (8 men and 8 women, aged 41-79 yr) and in healthy German controls living in the same Bavarian area of Erlangen-Nurnberg and its immediate vicinity. By stereomicroscopy, finger- or leaf-shaped villi were found exclusively both in patients and controls. Convoluted or flat mucosa could not be detected in dermatitis herpetiformis patients. Accordingly, in all cases, normal structure of jejunal mucosa without signs of mucosal or submucosal inflammation was demonstrated histologically. However, mean counts of interepithelial lymphocytes in dermatitis herpetiformis patients were slightly but significantly increased over controls. Intestinal disaccharidase activities were not statistically different from those of healthy control subjects, and oral lactose tolerance tests were normal in each of 8 patients tested. It is suggested that immunological and genetic differences between dermatitis herpetiformis patients reported in British and American papers and the patients studied in this report may be responsible for the basically differing results as to "dermatogenic enteropathy". Moreover, the mean ages of patients reported in other studies were about 19 to 26 yr below the mean age found in this study. It is suggested that the age of first manifestation and follow-up of dermatitis herpetiformis may also be important factors in the nature and frequency of intestinal involvement in dermatitis herpetiformis.

5906 PREGNANCY IN PATIENTS WITH COELIAC DISEASE.

(E.) Ogborn, A. D. R. (Hammersmith Hosp., London, England). *Br. J. Obstet. Gynaecol.* 82(4):293-296, 1975.

The effects of dietary management and supportive obstetric care on the course and outcome of pregnancies in patients with celiac disease were studied. Twenty-five women, who had previously gone through a total of 38 pregnancies, were placed on a strict gluten-free diet and given calcium gluconate twice daily (1.5 g, p.o.), vitamin B_{12} (1000 μg, i.m.) after 6, 20, and 34 weeks of gestation, and compound i.m. vitamins once weekly. Exacerbations of diarrhea were controlled by hospital rest, dietary supervision, and salicylazosulfapyridine or codeine phosphate as necessary. Progesterone status was monitored during the first 16 weeks and hydroxyprogesterone (250 mg twice weekly) given as indicated. Fetoplacental function was monitored during the third trimester and the fetus was closely monitored during labor. The perinatal mortality in patients on an unrestricted diet was 7%, 74% of the 38 pregnancies in women on unrestricted diets ending in the birth of a viable infant which survived the neonatal period. The perinatal mortality rate in the treated patients was 10%, 86% of the pregnancies in this group ending in the birth of a viable infant which survived the neonatal period. None of the babies had celiac disease. Although no significant differences were demonstrable between the treated and untreated groups, the apparent overall improvement in outcome of the pregnancies with dietary management and obstetric supervision was encouraging.

5907 IN VITRO PATHOGENETIC STUDIES OF COELIAC DISEASE: EFFECTS OF PROTEIN DIGESTS ON COELIAC INTESTINAL BIOPSY SPECIMENS MAINTAINED IN CULTURE FOR 48 HOURS.

(E.) Jos, J.; Lenoir, G.; de Ritis, G.; Rey, J. (Hosp. Enfants-Malades, Paris, France). *Scand. J. Gastroenterol.* 16(1):121-128, 1975.

The effects of various gliadin and casein digests on celiac intestinal biopsy specimens maintained in culture for 48 hr were studied. Biopsy specimens were taken at the duodeno-jejunal flexure from 11 control children, 24 children with treated celiac disease, and 20 children with untreated celiac disease. The specimens were incubated at 37 C for 48 hr in media containing antibiotics and, in some cases, various peptic-tryptic (PT) or peptic-tryptic-chymotryptic (PTC) digests of gliadin and casein. The specimens were examined immediately after excision and after 48 hr incubation by light and electron microscopy. The morphologic abnormalities in the surface epithelial cells in 11 of the 14 biopsy specimens from children with active celiac disease disappeared almost immediately during culture in the absence of gliadin digests. In flat biopsies cultured in the presence of the PT gliadin digest, epithelial restoration was inhibited and a cytotoxic effect was obvious; a similar effect was observed in the presence of the PTC gliadin digest and the autoclaved PT gliadin digest. The casein hydrolysates exerted a slight toxic effect which seemed to be reduced by autoclaving. In the control specimens and in 16 restored celiac biopsies from patients in remission, there was no or little change after culture in the presence of gliadin or casein digests. In 6 of 11 biopsy specimens taken from 8 patients in remission after gluten challenge, PT, autoclaved PT, and PTC gliadin digests all exerted an obvious cytotoxic effect; in most cases, no such effect was seen in the presence of the PT digest of casein. In all specimens studied, thorough PTC hydrolysis of gliadin abolished all of its *in vitro* toxic effects. The results suggest that the toxicity of gliadin is related to a relatively large peptide, which supports the hypothesis of a basic immune process.

LIBRARY

5908 MACROAMYLASEMIA ASSOCIATED WITH MALABSORPTION AND CRYOGLOBULINEMIA: CLINICAL AND BIOLOGICAL STUDY OF A NEW CASE. *(Fr.)* Touboul, J. P.; Hadchouel, P.; Hirsch-Marie, H.; Caroli, J.; Renault, H. (St. Antoine Hosp., Paris, France). *Med. Chir. Dig.* 3(6):419-426, 1974.

A new case of macroamylasemia associated with malabsorption and cryoglobulinemia was reported in a 33-yr-old woman with persistent and marked elevated amylasemia contrasted by normal amylasuria. The patient also suffered from severe weight loss (15 kg), asthenia, diarrhea and Raynaud's phenomenon. The macroamylase, demonstrated by serum electrophoresis and chromatography, was an amylase-IgA complex. Malabsorption, verified by various tests (quantitative analysis of fat in feces, induced hyperglycemia, lactose test, D-xylose test), may explain the anomalies observed in the hepatic picture (lowered cholesterol and lowered coagulation factors). Cryoglobulinemia, which was not involved in macroamylasemia, was due to the presence of IgA. Hematological results showed marked lymphoplasmocytic-type medullary infiltration. Although the patient did not exhibit classical dysglobulinemia, the coincidence of malabsorption and lymphoplasmocytic-type medullary infiltration might lead to the eventual appearance of a system disease. A review of the literature seems to indicate the relatively frequent association between IgA-macroamylasemia, malabsorption, alcoholism and pancreatitis.

5909 FOLLOW-UP STUDY OF PATIENTS WITH CELIAC DISEASE. *(Ger.)* Emons, D.; Bohm, E. R.; Rotthauwe, H. W. (Pediatr. Clin., Univ. Bonn, Germany). *Dtsch. Med. Wochenschr.* 99(38):1847-1853, 1974.

Follow-up examinations were performed on 25 children (ten boys and 15 girls) who had been given diet therapy for celiac disease diagnosed clinically before 3 yr of age on the basis of retarded development, distended abdomen, and pathologically loose stools (recurrent diarrhea in almost all cases, but abnormally bulky stools in only a few). In 13 cases the diagnosis was considered confirmed on the basis of abnormal xylose tests and prompt response to a gluten-free diet. Anemia, which often occurs in the first few weeks after institution of diet therapy, developed in 21. Life-threatening toxicosis occurred in four patients and was associated with hypoproteinemia and protein-deficiency edema in one. Cystic fibrosis was ruled out in all 25 children by the sweat test. Enteropathogenic bacteria were present initially or intercurrently in eight cases, and radiological examinations revealed the presence of functional gastrointestinal disorders in seven of the eight patients examined. Osteoporosis was radiologically diagnosed in seven children, but none had radiological or biochemical evidence of manifest rickets. At follow-up, villous atrophy was found on duodenal biopsies in 20 of these 25 children, and another patient developed marked villous atrophy 9 months after diet therapy was discontinued. The intestinal mucosa was completely normal in four cases. Patients with villous atrophy had eaten gluten-free diets for 6 months to 5 yr (mean 2 yr), and had eaten normal food for 9 months to 8 yr before biopsy. At follow-up, only one of these 21 patients had clinical and biochemical signs of a recurrence; although a long-term, gluten-free diet was prescribed, the parents failed to cooperate. Only three of these 21 children had to be treated for intestinal disorders when they started eating normal food. Clinical findings, hemoglobin levels, stool fat contents, and xylose test were normal on all but one of the 21 children with persistent villous atrophy at follow-up.

5910 TOTAL BODY POTASSIUM IN CHILDREN, WITH PARTICULAR REFERENCE TO COELIAC DISEASE. *(E.)* Boddy, K.; King, P. C.; Carswell, F. (Scottish Univ. Res. Reactor Cent., Glasgow). *Clin. Sci. Mol. Med.* 49(2):133-137, 1975.

Total body potassium was measured by whole-body counting in 20 children (11 males and nine females, 8 months to 13 yr and 10 months of age) with celiac disease and was compared with similar measurements in 20 children having diseases in which there was no clinical suspicion of electrolyte or water disturbance. The controls were matched as closely as possible with respect to sex, age, and height. All children were on a gluten-containing diet at the time of measurement. Total body potassium was estimated by detecting the 1.46 MeV gamma rays of ^{40}K, which is naturally radioactive and a constant fraction of natural body potassium. There was no significant difference between the measured values of total body potassium (in mM) in children with celiac disease and in control children or between males and females. At the clinical level, infantile celiac disease does not parallel malnutrition with respect to body potassium; potassium deficiency is not a complication of this disease. It is suggested that the potassium deficiency in malnutrition is a direct result of dietary factors. Apparently, in celiac disease, the potassium presented for absorption is evidently handled normally or there is compensatory retention by the body to accomodate abnormalities in absorption, giving a long-term normal balance.

5911 A CASE INDICATIVE OF THE EXISTENCE OF A CONNATAL FORM OF WHIPPLE'S DISEASE. *(It.)* De Pra, M.; Casagrande, A.; Guarino, M. (Dept. Pediatr., Tirano Gen. Hosp., Italy). *Minerva Pediatr.* 26(34): 1723-1743, 1974.

5912 DIAGNOSIS OF CELIAC DISEASE IN A SERIES COVERING THE YEARS 1969-1973. *(It.)* Ansaldi, N.; Santini, B.; Barbera, C.; Bianchini, O.; Oderda, G. (Pediatr. Clin. II, Univ. Turin, Italy). *Minerva Pediatr.* 26(35):1757-1764, 1974.

5913 REGENERATION OF THE MUCOUS MEMBRANE OF THE SMALL INTESTINE IN SELECTED CASES OF MALABSORPTION SYNDROME. *(Pol.)* Orlowska, J.; Ratajczak-Majewska, C. (CMPK, Warsaw, Poland). *Patol. Pol.* 25(4):603-610, 1974.

5914 MALABSORPTION SYNDROME WITH ACQUIRED AGAMMAGLOBULINEMIA AND SELECTIVE IgA DEFICIENCY WITH CIRCULATING B-LYMPHOCYTES. *(Ger.)* Knolle, J.; Bolte, J. P.; Hopf, U.; Olbermann, M.; Meyer zum Buschenfelde, K. H. (Med. Clin. II, Univ. Mainz, Germany). *Z. Gastroenterol.* 13(3):387-392, 1975.

5915 WHIPPLE'S DISEASE. GASTROINTESTINAL BIOPSY FINDINGS AND HISTOCHEMISTRY IN ONE CASE. *(It.)* Cheli, R.; Ramasso, M.; Nicolo, G.; Aste, H. (Munic. Hosp., Genoa, Italy). *Minerva Gastroenterol.* 20(2):77-78, 1974.

5916 CLINICAL EXPERIENCE WITH HYLAKOMBUN (5,7-DICHLORO-8-HYDROXYQUINOLIN) IN GASTROENTEROLOGY. *(Ger.)* Kocian, V. J.; Kocianova, J. (Inst. Med. Res., Prague, Czechoslovakia). *Wien. Med. Wochenschr.* (Suppl. 25):1-8, 1975.

5917 INTESTINAL MALABSORPTION DUE TO MULTIPLE DIVERTICULOSIS OF THE DUODENUM AND SMALL INTESTINE: REPORT OF A CASE. *(Sp.)* de Aguiar Gonzalez, A. R.; Santillana Lopez, T.; Pardo Redondo, A. (San Carlos Hosp. Clin., Madrid, Spain). *Rev. Clin. Esp.* 134(5):485-490, 1974.

5918 SELECTIVE VITAMIN B_{12} MALABSORPTION (IMMERSLUND-GRASBECK SYNDROME) AS A CAUSE OF DEVELOPMENTAL DISORDERS IN EARLY CHILDHOOD. *(Ger.)* Harms, K.; Bohne, A.; Kollmann, D. (Pediatr. Clin., Univ. Munich, Germany). *Monatsschr. Kinderheilkd.* 123(5):428, 1975.

5919 DIAGNOSIS AND THERAPY OF CONGENITAL AND INHERITED DISACCHARIDASE DEFICIENCIES OF THE SMALL INTESTINAL MUCOUS MEMBRANE. *(Ger.)* Niessen, K. H.; Brugmann, G.; Schmidt, K. (Child. Clin., Univ. Tubingen, Germany). *Monatsschr. Kinderheilkd.* 123(5):429-431, 1975.

5920 CORRELATION IN THE DIAGNOSIS OF INTESTINAL LACTASE DEFICIENCY BETWEEN THE RADIOLOGICAL METHOD AND THE LACTOSE TOLERANCE TEST. *(E.)* Lisker, R.; Lopez Habib, G.; Mora, M. A.; Pitol, A. (Natl. Inst. Nutr., Tlalpan, Mexico). *Rev. Invest. Clin.* 27(1):1-5, 1975.

5921 GLUTEN-SENSITIVE ENTEROPATHY AND INTESTINAL LYMPHORETICULOSIS. A CASE REPORT. *(E.)* Fehmers, M. C. O.; Wilderink, F.; Oushoorn, H. H.; Tytgat, G. N. (Dep. Med., Univ. Amsterdam, Netherlands). *Neth. J. Med.* 18(2):83-88, 1975.

5922 A STUDY OF INTESTINAL ABSORPTION IN SUBJECTS WITH PLURIDISTRICTUAL ATHEROSCLEROSIS. *(E.)* Bracale, G.; Budillon, G.; Squame, G.; Masciariello, S.; Gagliardi, C.; Cimino, L.; Mazzacca, G. (Fac. Med., Univ. Napal, Italy). *Surg. Ital.* 4(1):14-19, 1974.

5923 REVERSIBLE INFERTILITY IN MALE COELIAC PATIENTS. *(E.)* Baker, P. G.; Read, A. E. (Dep. Med., Univ. Bristol, England). *Br. Med. J.* 2(5966):316-317, 1975.

5924 CORRELATION OF LACTASE ACTIVITY, LACTOSE TOLERANCE AND MILK CONSUMPTION IN DIFFERENT AGE GROUPS. *(E.)* Lebenthal, E.; Antonowicz, I.; Shwachman, H. (Harvard Med. Sch., Boston, Mass.). *Am. J. Clin. Nutr.* 28(6):595-600, 1975.

5925 XYLOSE ABSORPTION TEST BEFORE AND AFTER SURGICAL REPAIR OF COARACTATION OF THE AORTA. *(E.)* Markiewicz, A.; Wojczuk, D.; Zmudzinski, J. (Silesian Sch. Med., Katowice, Poland). *Acta Hepatogastroenterol.* 22(2):112-117, 1975.

5926 AN ASSESSMENT OF GASTRO-INTESTINAL AND ENDOCRINE FUNCTIONS. IN PATIENTS WITH THE MALABSORPTION SYNDROME. *(E.)* Tripathi, S. N.; Misra, A. K.; Srivastava, S. K. (Inst. Med. Sci., Banaras Hindu Univ., Varanasi, India). *Am. J. Proctol.* 26(3):79-86, 1975.

See also, 5205, 5670, 5672, 5691, 5866, 6497, 6506, 6548, 6586.

LARGE INTESTINE

5927 SOCIAL CLASS DIFFERENCES AMONG PATIENTS WITH LARGE-BOWEL CANCER IN CALI, COLOMBIA. *(E.)* Haenszel, W.; Correa, P.; Cuello, C. (Natl. Cancer Inst., Bethesda, Md.). *J. Natl. Cancer Inst.* 54(5):1031-1035, 1975.

Social class differences associated with risk of large-intestine cancer were studied based on data from a population-based cancer registry in Cali, Colombia. The analysis covered 214 newly diagnosed cases of adenocarcinoma of the large intestine registered among residents of Cali between 1962-1971. Findings on social class differences in the prevalence of intestinal polyps in 404 autopsies among Cali residents were also included, and measurements were made on fresh colon specimens taken from 4 persons dying from accidental causes to examine the relation between tissue at risk and cancer incidence by segment. The risk of large-intestine cancer in males and females of all ages was higher for persons in the upper and middle socioeconomic classes than for those of the two lower socioeconomic classes. Risk of cancer of the stomach and uterine cervix was inversely related to social class. The socioeconomic gradients associated with risk of large bowel cancer were most marked for cancer of the ascending and rectosigmoid colon and were minimal for cancer of the cecum and rectum. These data present several parallels with information derived from comparisons of developed and developing countries and also appear consistent with recent information on the possible role of dietary factors in intestinal cancer. It is likely that strong associations between specific dietary items and income facilitated the detection of a socioeconomic gradient for large-intestine cancer in Cali.

5928 GUT BACTERIA AND THEIR METABOLIC ACTIVITIES IN FAMILIAL POLYPOSIS.

(E.) Bone, E.; Drasar, B. S.; Hill, M. J. (Cent. Public Health Lab., London, England). *Lancet* 1(7916):1117-1120, 1975.

Early work suggested that patients with cancer of the large intestine carry clostridia capable of dehydrogenating the steroid nucleus and also have high fecal bile-acid concentrations. Therefore, colonic environmental factors were investigated in familial polyposis, a disease predisposing to colorectal cancer. Samples of rectal contents and urine were obtained from 6 affected children of polyposis patients, 13 unaffected children of polyposis patients, 27 polyposis patients who had been treated by colectomy and ileorectal anastomosis, 11 ulcerative colitis patients treated by colectomy and ileorectal anastomosis, 8 patients treated for colonic carcinoma by partial colectomy and anastomosis, and 3 patients with benign polyposis syndromes not thought to predispose to malignancy. Although a high proportion of the affected and unaffected children of polyposis patients carried clostridia able to dehydrogenate the steroid nucleus, their average rectal bile-acid concentration was low. In addition, the bile acids were in many cases poorly degraded and were characterized by the presence of chenodeoxycholic acid; in 11 of these patients, including half of the unaffected children, less than 25% of the fecal cholesterol had undergone conversion to coprostanol or coprostanone by the gut flora, although these flora were able to degrade cholesterol *in vitro*. In the treated polyposis patients, rectal bile-acid and neutral-steroid concentrations were low and the cholesterol was virtually undegraded; the cholesterol had undergone some degradation in all of the ulcerative colitis patients who had undergone similar treatment. The results suggest that the inability of the polyposis patients and their unaffected children to degrade cholesterol in the intestine was due to unfavorable conditions in the intestine, a hypothesis that is favored by the lack of cyclic secondary amines in the urine of these persons (these amines are also synthesized by bacteria in the gut). If the unaffected children who were not able to degrade cholesterol later develop polyposis, the degradation of cholesterol by the gut flora would appear to be a simple diagnostic test for persons at high risk of developing polyposis.

5929 PNEUMATOSIS CYSTOIDES INTESTINALIS: TREATMENT WITH OXYGEN VIA CLOSE-FITTING MASK.

(E.) Simon, N. M.; Nyman, K. E.; Divertie, M. B.; Rovelstad, R. A.; King, J. E. (Mayo Clin., Rochester, Minn.). *JAMA* 231(13):1354-1356, 1975.

Treatment of four patients (2 men and 2 women, aged 64-69 yr) suffering from pneumatosis cystoides intestinalis with oxygen via a close-fitting mask is described. Symptoms included frequent, watery bowel movements, rectal bleeding, flatulence, and abdominal pain. The patients were treated with 70% oxygen administered by close-fitting mask for 5-8 days, after which all symptoms ceased and proctoscopic and barium-contrast roentgenographic findings in the colon were normal. Six months after oxygen treatment, one woman developed slight rectal bleeding which was confirmed as pneumatosis cystoides intestinalis in the rectosigmoid. The patient again responded favorably to oxygen therapy. Although pulmonary damage may result from oxygen exposure, even in patients with normal lungs, prompt withdrawal of oxygen therapy is generally effective in restoring normal pulmonary function within 1-2 days. In the absence of major disturbances of ventilation and perfusion, intermittent administration of 70% oxygen via close-fitting mask should be capable of increasing the nitrogen gradient between a closed space and capillary blood to a degree sufficient to ensure rapid diffusion from one to the other. During daytime meals and at other brief intervals, nasal cannulas may be used to deliver oxygen at 3-4 liters/min. On a program of this kind, with monitoring of vital capacity, the possibility of toxic effects from oxygen is greatly diminished, while the therapeutic needs of the patient can be met effectively. Oxygen treatment can be justified only for patients who have the symptomatic form of pneumatosis cystoides intestinalis and follow-up of patients treated in this manner is indicated.

5930 THE SPECTRUM OF COLITIS ASSOCIATED WITH LINOMYCIN AND CLINDAMYCIN THERAPY.

(E.) Le Frock, J. L.; Klainer, A. S.; Chen, S.; Gainer, R. B.; Omar, M.; Anderson, W. (West Virginia Univ. Med. Cent. Hosp., Morgantown). *J. Infect. Dis.* 131(Suppl):108-115, 1975.

The clinical, laboratory, sigmodoscopic, x-ray, and biopsy findings in 10 patients (7 women and 3 men, aged 22-70 yr) who developed colitis after lincomycin or clindamycin therapy are reported. Prior to antibiotic therapy in standard dosages, none of the patients had prior histories suggestive of preexisting bowel disease. An abrupt onset of diarrhea, crampy abdominal pain, fever, and leukocytosis was observed 1-12 days after discontinuation of the drug. Proctoscopic examination revealed erythematous friable mucosa covered with small raised, yellowish-white plaques that were sometimes confluent. Barium contrast studies of the colon demonstrated irregular, shaggy mucosa, ulcerations, cobblestone appearances, and thumb printing. Rectal biopsy showed acute inflammation with pseudomembranes with focal or superficial ulcerations. The clinical course lasted an average of 4 weeks, although all 10 patients recovered with supportive management consisting of administration of parenteral fluids and electrolytes supplemented with albumin. Antibiotic therapy in such cases is contraindicated unless secondary infection is present, and adrenocorticotropin hormone and steroids appeared to be of little value in modifying the course of the disease. Follow-up barium enemas and proctoscopy were done on all patients after supportive treatment and were normal. A history of diarrhea, fever, and mucosal changes seen on proctoscopy in a patient who has recently received clindamycin or lincomycin should raise the possibility of therapy-associated colitis, and clindamycin should be used only when indicated in serious infections.

5931 THE DETECTION OF ABERRANT DNA SYNTHESIS IN A MEMBER OF A HIGH-RISK CANCER FAMILY.

(E.) Deschner, E. E.; Long, F. C.; Katz, S. (Mem. Sloan-Kettering Cancer Cent., New York, N.Y.). *Am. J. Dig. Dis.* 20(5):418-424, 1975.

Examination of 4 siblings of a patient with multiple polyposis was performed with radiological, sigmoidoscopic, cytologic, and isotopic labeling procedures for the possible presence of colonic polyps. The patients, 3 men and 1 woman, were all over 40 yr of age. Polyps were absent on films as well as on endoscopy, and colonic cytologies of all 4 subjects were within normal limits. However, isotopic incorporation studies revealed the presence of an abnormal labeling pattern in some crypts of the biopsy incubated with tritiated thymidine of 1 family member. Along with normal crypts with label in the lower 2/3 of the colonic crypts, many crypts had cells labeled at the surface. Some of the surface cells removed by colonic wash were also isotopically labeled; thus, a defect in the regulation of colonic epithelial cell replication was found. The results suggest that in patients where such positive findings arise, periodic and intensive examinations should be performed, preferably by colonoscopy, to aid in the early detection of colon cancer.

5932 APPEARANCE AND GROWTH OF EARLY CARCINOMAS OF THE COLON-RECTUM.

(E.) Ekelund, G.; Lindstrom, C.; Rosengren, J.-E. (Dep. Surg., Univ. Lund, Malmo, Sweden). *Acta Radiol.* [*Diagn.*] *(Stokh.)* 15(6):670-679, 1974.

A series of 30 patients with carcinoma of the colon-rectum was examined in retrospect for preceding signs of polypoid lesions at the site where a carcinoma had later been diagnosed. Repeated double contrast roentgenography had been used routinely for examinations of the colon during a mean observation time of 5 yr. When first demonstrated, all but 4 of the polypoid tumors had at least 1 roentgenographic sign of malignancy. The mean linear growth rate was 0.61 mm/month. The 5-yr survival rate was 57%. Metastases were found in 19 cases. The results suggest that tumors with roentgenographic appearance of malignancy should be removed as soon as possible and that careful observation with repeated roentgenography is imperative in the absence of malignant signs.

5933 PREOPERATIVE RADIOTHERAPY FOR COLORECTAL CANCER.

(E.) Higgins, Jr., G. A.; Conn, J. H.; Jordan, Jr., P. H.; Humphrey, E. W.; Roswit, B.; Keehn, R. J. (VA Surg. Adjuvant Group, Washington, D.C.). *Ann. Surg.* 181(5):624-631, 1975.

In a prospective randomized trial, 700 patients with a confirmed histologic diagnosis of adenocarcinoma of the rectum or rectosigmoid were randomized to receive radiotherapy (2000-2500 rads in two weeks) prior to operation or to receive surgery alone. Five-year observed survival in the 453 patients on whom "curative" resection was possible was 48.5% in the x-ray treated group, compared with 38.8% in those who underwent surgery alone. In the 305 patients having low lying lesions which required abdominoperineal resection, survival in the group treated with x-ray was 46.9% compared with 34.3% in those who underwent surgery alone. Although these figures suggest a treatment benefit gained from the use of x-ray with surgery, neither figure is considered statistically significant. Histologically positive lymph nodes were found in 41.2% of the surgery only group but in only 27.8% of those patients receiving radiotherapy. Review of all patients who died during the study shows a consistently lower death rate from cancer in the radiotherapy group. Further studies are in progress to determine the optimal dose regimen.

5934 CARCINOID TUMOUR AND CROHN'S DISEASE.

(E.) Tehrani, M. A.; Carfrae, D. C. (West. Infirm., Glasgow, Scotland), *Br. J. Clin. Pract.* 29(5):123-124, 1975.

A case of Crohn's disease is reported in which carcinoid tumor was an incidental finding on pathological examination of the resected small bowel. A tiny focus of carcinoid tumor (3-4 cells) was present in histological sections of the terminal ileum. Reexamination of the gross specimen demonstrated seven small yellow mucosal plaques in the terminal 30 cm of the small intestine. Sections confirmed the presence of multiple mucosal and subsequent mucosal deposits of carcinoid tumor, with no extension of the tumor through the bowel wall. A marked focal increase in argentaffin-cells was noted in the resected specimen. Only one previous case of carcinoid tumor coexisting with Crohn's disease has been reported in the literature. Although it is unlikely that a true relation exists between regional enteritis and carcinoid tumor other than the long-accepted association of malignancy and chronic inflammation, the possibility of coexistence should be kept in mind by both the clinician and the pathologist.

5935 VARIATIONS IN CARCINOEMBRYONIC ANTIGEN LOCALIZATION IN TUMORS OF THE COLON.

(E.) Rogalsky, V. Y. (P. A. Herzen Res. Inst. Oncol., Moscow, USSR). *J. Natl. Cancer Inst.* 54(5):1061-1071, 1975.

The localization of carcinoembryonic antigen (CEA) in 78 tumors of the human colon was studied using antibody to CEA in an indirect Coons test. Morphologically it was possible to divide the neoplasms into two types: tissues in which CEA was localized in cells, and tissues in which malignant cells secreted CEA in greater or lesser quantity. In the first type of tissue, five forms of cells were noted: goblet-like, small vacuolar, limbic, those with intracellular accumulation of antigen, and diffuse. Tumor tissue secreting CEA could also be divided into 5 forms: holocrine-like, aprocrine-like, intraglandular, apical-basal, and lacunar-infiltrative. Thus, this study demonstrated that in malignant tissue there is a change in CEA localization as compared with that in cells of corresponding normal tissue. Several variations of CEA localization were observed. Tumor cells were found capable of secreting considerable amounts of this component. The change of antigen localization in the cell or its secretion was named antigenic translocation by the author.

5936 CHEMOTHERAPY AS AN ADJUVANT TO SURGERY FOR COLORECTAL CANCER.

(E.) Lawrence, Jr., W.; Terz, J. J.; Horsley, III, S.; Donaldson, M.; Lovett, W. L.; Brown, P. W.; Ruffner, B. W.; Regelson, W. (Virginia Cancer Cent., Richmond). *Ann. Surg.* 181(5):616-623, 1975.

A combined intraoperative and postoperative adjuvant program of 5-fluorouracil (5 FU) for patients undergoing "curative" resection for adenocarcinoma of the colon and rectum was undertaken. Beginning in January 1968, patients were randomly assigned to an intraluminal 5 FU or intraluminal control (saline) group and were so treated at the time of surgical resection if findings at that time indicated that all gross neoplastic disease could be resected. Patients with operative findings denoting incurability were eliminated from the study after surgical exploration. Patients receiving intralumina 5 FU (30 mg/kg) received i.v. 5 FU (10 mg/kg) on each of the first 2 postoperative days and 5 subsequent postoperative courses of p.o. 5 FU (90 mg/kg in each 18-day course) over a 1-yr period. After a time of 6 yr, 156 patients had entered the study. Survival curves and "disease-free" curves for comparison of the group receiving 5 FU and the control group reveal no significant benefit from this intensive adjuvant course of 5 FU thus far. It is concluded that the benefit of prolonged adjuvant therapy with 5 FU for patients undergoing "curative" surgery for colorectal cancer is inadequate to justify its general use at this time.

5937 THE LATEST FINDINGS IN THE DIFFERENTIAL RADIOLOGICAL DIAGNOSIS OF ACUTE ILEUS.

(Ger.) Bsteh, O. (Reg. Hosp., Mistelbach, Austria). *Radiol. Clin. Biol.* 44(1):14-23, 1975.

The pathophysiology of acute obstructive and paralytic ileus is considered, and the use of the barium enema to distinguish between these two conditions is discussed. In paralytic ileus, absorption, which ordinarily occurs in the right colon down to the splenic flexure, is replaced by exudation associated with gas production and motor paralysis. The left colon remains contracted, and the contrast medium passes readily into the right colon where it mixes with the formation of fluid levels. In obstructive ileus of the small intestine, the small intestine is distended with gas and shows fluid levels, while the colon is contracted throughout its entire length. Paralytic enterocolitis in elderly patients, which results from abnormal bacteriological flora in the small intestine, is characterized by discharge of toxic intestinal contents into the cecum where they produce inflammation and, in some cases, symptoms of appendicitis. In these patients, a barium enema provides a rapid and reliable diagnosis and often evacuates the intestine by dilating the spastically contracted left colon; cholinergic agents, administered parenterally, may also be indicated. A case report is presented for a patient in the 9th decade who developed acute ileus as a result of an extremely large scrotal hernia. A barium enema revealed paralytic ileus with enterocolitis, and the patient responded to conservative therapy. Barium enemas are also useful in the diagnosis of ileus in small children and of postoperative ileus. The technique is considered safe in all cases. In a 25-yr period, the author operated on 817 patients with perforated appendices with a total mortality of 4%; none of these patients died as a result of obstructive ileus. Cases of paralytic postoperative ileus were diagnosed and treated conservatively; none of these patients died either with the exception of 12 who also had peritonitis. Barium enemas are also recommended for establishing a differential diagnosis in rarer conditions, e.g., gallstone ileus, where the colon is empty and contracted, the small intestine is distended with fluid levels, and gas has collected in the biliary tract.

5938 BEHCET'S DISEASE AND TOXIC MEGACOLON.

(Ger.) Roenspies, U.; Saegesser, F. (Dept. Surg., Univ. Lausanne, Switzerland). *Schweiz. Med. Wochenschr.* 105(7):199-204, 1975.

A 31-yr-old woman with a history of sporadic arthralgias in the fingers, wrists, and spine, an allergy to dust, and hayfever was treated for bilateral uveitis and allergic conjunctivitis; no evidence of hypopyon was found at this time. Two months later she was hospitalized with a fever, erythema nodosum, aphthae of the oral and vaginal mucosa, dermatographia, colic-like abdominal pain, and postprandial diarrhea. *Staphylococcus aureus* was cultured from the stools. X-rays revealed dilatation of the ileum and the onset of irregularities in the wall of the colon. After 1 week she developed rectal bleeding, meteorism, and marked dilation of the colon with loss of haustration. These clinical and radiological signs of toxic megacolon were consistent with a diagnosis of ulcerative hemorrhagic proctocolitis. However, this diagnosis was ruled out by normal endoscopic and histological findings. The patient responded to conservative treatment with transfusions, protein and electrolyte substitution, antibiotics, corticosteroids, salicylazosulfapyridine, and vitamins but developed a pulmonary embolism after one week. Ten days after the development of toxic megacolon, x-rays showed "thumb printing" of the entire colon, as has been found in ischemic colitis; a double contrast enema showed colonic edema. A complete remission was obtained after 14 days of conservative therapy, but six months later a barium enema still revealed absence of haustration, particularly in the transverse and descending colon and the sigmoid, "thumb printing," and spicules. These findings are consistent with Crohn's disease or ischemic colitis. However, since the patient had no symptoms during the next 1.5 yr, Crohn's disease was ruled out. The history of bilateral uveitis, oral and vaginal aphthae, erythema nodosum, and pulmonary embolism suggests that the patient has Behcet's disease. Toxic magacolon is attributed to ischemic disorders in the entire colon associated with ulceration and a staphylococcal infection.

5939 CLINICAL ASPECTS, THERAPY, AND PROGNOSIS FOR CARCINOMA OF THE LARGE INTESTINE. *(Ger.)* Braun, L. (Surg. Clin. Polyclin., Univ. Munster, Germany). *Bruns Beitr. Klin. Chir.* 221(7): 503-515, 1974.

In a 22-yr period, 475 patients (266 males and 191 females, mean age 57.3 yr) were treated for histologically confirmed carcinomas of the colon, rectum, or anus. About half of all these tumors were located in the rectum, one-fourth to one-fifth in the sigmoid, and the rest occurred proportionately in the other parts of the large intestine. These patients consisted of 50% with stages A and B tumors, 17% with stage C, and 33% with stage D according to Duke's classification. Associated or pre-existing intestinal diseases consisted of hemorrhoids (15.6%), polyps (9.2%), typhoid fever (3.5%), diarrhea (3.1%), polyposis (2.9%), ulcerative colitis (2.6%), diverticulosis and/or diverticulitis (2.2%), fistulas and/or fissures (1.8%), periproctic abscess (0.7%), papilloma (0.4%), tuberculosis (0.4%), adenoma (0.2%), endometriosis (0.2%), and fibromatosis (0.2%). In the 390 cases for which information was available, 174 had metastases, 182 did not, and the presence or absence of metastases was in doubt in 34. The most common site of metastases was the lymph nodes (62 cases), followed by the peritoneum (43), liver (54), intestine (19), skin (16), lungs (10), female genitalia (9), bones (8), kidneys (4), and brain (2). Of these 457 patients, 423 (97.7%) were treated surgically. In 279 cases (66.0%) the tumor was completely removed; palliative surgery only was possible in 121 cases (28.6%); and tumors were inoperable at laparotomy in 23 cases (5.4%). Of the 457 operated patients, 102 (24.1%) died while still in the hospital; 12% died within the first 14 days after surgery. The causes of death were cardiovascular failure (31.4%), ileus (20.5%), inflammatory complications (19.6%), pulmonary embolism (16.7%), cachexia (8.0%), carditis (1.9%), and uremia (1.9%). Of the 16 patients treated conservatively, three lived for more than two yr. The five-yr survival rate was 0% for patients with inoperable tumors, 7.3% for those treated palliatively, and 32.6% for those who underwent radical surgery. The two-yr mortality was significantly lower (39.4%) in patients who received radiotherapy postoperatively than in those who did not (64.8%). After five yr, this difference was only 5.0%.

5940 A STUDY OF LYMPH NODES DRAINING COLORECTAL CANCER USING A TWO-STAGE INHIBITION OF LEUCOCYTE MIGRATION TECHNIQUE. *(E.)* Guillou, P. J.; Brennan, T. G.; Giles, G. R. (St. James Hosp., Leeds, England). *Gut* 16(4):290-297, 1975.

Leucocyte migration studies designed to investigate the sensitization of both peripheral and lymph node lymphocytes to tumor-associated antigens were performed in 14 patients suffering from adenocarcinoma of the colon and rectum. The results were compared with those of identical investigations on the peripheral blood and lymph node lymphocytes of ten control patients with benign gastrointestinal disease. Peripheral blood studies were performed on the morning of operation. Nodes were obtained from the root of the mesentery and from a paracolonic site in the controls and from the mesentery and a group of nodes draining the tumor in the patients; 14 nodes were obtained from the control subjects and 25 nodes from the patients with colorectal cancer. In five controls and 11 patients with cancer, a complete set of results was obtained for peripheral blood, mesenteric nodes, and paracolonic nodes. Leucocyte migration in the supernatant from control cells cultured with both normal colonic mucosal extract and tumor extract showed minor variations, but there were no significant differences between peripheral blood, mesenteric, and paracolonic lymph. The findings suggest that sensitization of local nodes may occur early in the progression of malignant disease; it may be lost when the lymph nodes become involved with tumor metastases. The results confirmed that some lymph nodes draining colorectal carcinomata contain sensitized lymphocytes, but the degree of sensitization to tumor extract does not seem greater than that seen in lymph nodes of the small bowel mesentery or of the peripheral blood.

5941 RESULTS OF THE COMBINED METHOD OF TREATMENT OF PATIENTS WITH CANCER OF THE RECTUM. *(Rus.)* Kozlovz, A. V.; Popova, T. V. (Dept. Clin. Radiol., Central Inst. Postgrad. Training Phys., Moscow, USSR). *Med. Radiol. (Mosk.)* 19(7):30-33, 1974.

5942 MACROFRACTIONATED PREOPERATIVE IRRADIATION IN COMBINED TREATMENT OF CANCER OF THE RECTUM. *(Rus.)* Sidorchenkov, V. O.; Baisogolov, G. D.; Berdov, B. A. (Dept. Radiother., Sci. Res. Inst. Med. Radiol., USSR). *Med. Radiol. (Mosk.)* 19(7):39-45, 1974.

5943 POLYPOSIS OF THE RECTUM AND COLON. *(Bul.)* Vijacki, L.; Krastev, M.; Manolov, G. (Fac. Med., Sofia, Bulgaria). *Khirurgiia (Sofiia)* 27(2): 147-151, 1974.

5944 CHANGES IN THE PHAGOCYTIC ACTIVITY OF LEUKOCYTES IN PATIENTS WITH ACUTE APPENDICITIS. *(Rus.)* Rybakov, A. I.; Dovzhikov, V. I. (Zaporozhie Med. Inst., USSR). *Vestn. Khir.* 114(2):42-44, 1975.

5945 A CASE OF PRIMARY CYSTIC PNEUMATOSIS OF THE COLON LOCALIZED TO THE SPLENIC FLEXURE. *(Fr.)* Mouchet, A.; Guivarc'h, M.; Marquand, J.; Barbagelata, M. (No affil.). *Chirurgie* 100(10):738-745, 1974.

5946 SURGICAL RESULTS IN POLYPOSIS OF THE COLON. *(Ger.)* Kugler, S.; Koch, G. (Dept. Gen. Surg., Univ. Clin. Surg., Hamburg-Eppendorf, Germany). *Bruns Beitr. Klin. Chir.* 221(8):583-591, 1974.

5947 MORPHOLOGICAL CHARACTERISTICS OF COLONIC POLYPOSIS. *(Ger.)* Jansen, H. H. (Inst. Pathol., Munic. Clin., Darmstadt, Germany). *Leber Magen Darm* 4(3):122-124, 1974.

5948 LYMPHOMAS OF THE INTESTINE--A CLINICOPATHOLOGICAL STUDY, WITH SPECIAL COMPARISON TO GASTRIC AND NODAL LYMPHOMAS. *(Jpn.)* Mari, S.; Yamaguchi, K.; Kino, I.; Oota, K. (Tokyo Univ. Med. Sch.). *Gan No Rinsho* 20(6):484-489, 1974.

5949 TREATMENT OF CARCINOMA OF THE RECTUM BY ELECTROCOAGULATION. *(Cz.)* Masurka, V.; Misek, J. (Fac. Med., Charles Univ., Hradec Kraklove, Czechoslovakia). *Rozhl. Chir.* 53(9):585-589, 1974.

5950 MALIGNANT TRANSFORMATION OF A PARARECTAL FISTULA CURED BY RADICAL SURGERY AND LOCAL PLASTIC REPAIR. *(Rus.)* Manuilenko, B. A. (Sakhalin Dist. Oncol. Clin., USSR). *Vestn. Khir.* 114(2):136-137, 1975.

5951 LONG-TERM RESULTS OF TREATING AN APPENDICEAL INFILTRATE. *(Rus.)* Brizgalov, V. E.; Firsov, V. D. (no affil.). *Sov. Med.* (2):100-103, 1975.

5952 RADIOLOGICAL DIAGNOSIS OF LATE COMPLICATIONS OCCURRING AFTER SURGERY ON THE RECTUM AND COLON. *(Rus.)* Siborov, V. S.; Chekurishvili, R. K. (Res. Lab. Proctol., Minist. Health RSFSR, Moscow, USSR). *Sov. Med.* (2):26-28, 1975.

5953 CONGENITAL MEGACOLON IN NEONATES AND INFANTS. *(Fr.)* Pasquie, M.; Petel, B. (Clin. Pediatr. Orthoped. Surg., Toulouse, France). *Cah. Med.* 15(10):669-676, 1974.

5954 GASTRECTOMY AND SURGERY FOR A HERNIA OF THE MESOCOLON ASSOCIATED WITH INTESTINAL MALROTATION. *(Ger.)* Woziwodzki, G. (Pritzwalk Dist. Hosp., Germany). *Zentralbl. Chir.* 99(45):1437-1438, 1974.

5955 SPONTANEOUS PERFORATION OF THE COLON AND ITS TREATMENT. *(Ger.)* Otto, K. (Med. Coll., Lubeck, Germany). *Zentrabl. Chir.* 99(44):1390-1394, 1974.

5956 PRECANCEROUS CONDITIONS OF THE COLON. *(Ger.)* Otto, P. (Med. Coll., Hannover, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:319-323, 1974.

5957 SEASONAL VARIATIONS IN THE CLINICAL COURSE OF ACUTE APPENDICITIS IN AREAS WITH HOT CLIMATES. *(Rus.)* Altiev, B. A. (Nebit-Dag Munic. Hosp., USSR). *Klin. Khir.* (3):71-72, 1975.

5958 CLINICAL SYMPTOMS AND RADIOLOGICAL FEATURES OF POLYPS IN THE APPENDICEAL STUMP. *(Ger.)* Keiler, A.; Staffen, A.; Zacherl, H.; Bardach, G. (2nd. Surg. Clin., Univ. Vienna, Austria). *Zentralbl. Chir.* 99(44):1402-1405, 1974.

5959 COMPLICATIONS OF DIVERTICULA OF THE COLON AND THEIR SURGICAL TREATMENT. *(Fr.)* Jacquet, N.; Desaive, C.; Melon, G.; Herman, P. (Surg. Clin., Univ. Liege, Belgium). *Rev. Med. Liege* 29(24):764-766, 1974.

5960 STATUS OF THE INTESTINE IN THYROID DISEASE. *(Rus.)* Mosin, V. I. (Stavropol Med. Inst., USSR). *Probl. Endokrinol.* 20(6):110-112, 1974.

5961 LYMPHANGIECTASIA IN THE MESOCOLON. *(Hun.)* Jakab, F.; Detky, B. (Clin. Surg. II, Semmelweiss Med. Univ., Budapest, Hungary). *Magy. Sebesz.* 27(6):401-404, 1974.

5962 COLON INTERPOSITION. *(Hun.)* Pas, E.; Pogany, Cs. (Clin. Surg. I, Semmelweiss Hosp., Budapest, Hungary). *Magy. Sebesz.* 27(6):382-384, 1974.

5963 SEVERE HEMORRHAGE IN DIVERTICULAR DISEASE OF THE COLON. *(It.)* Franchini, A.; Giardino, R. (1st. Semeiot. Chir., Univ. Bologna, Italy). *Chir. Gastroenterol.* 8(3):357-362, 1974.

5964 SINGLE POLYPS OF THE RECTUM--A PRECANCEROUS STAGE? *(Ger.)* Junemann, A.; Sailer, R.; Schacht, U. (Chir. Univ. Clin., Dusseldorf, Germany). *Med. Klin.* 69(43):1745-1748, 1974.

5965 ISCHAEMIC COMPLICATIONS OF OBSTRUCTIVE COLORECTAL CANCERS. *(It.)* Saegesser, F.; Tabrizian, M.; Rebagliati, M. (Serv. Univ. Chir., Lausanne, Switzerland). *Chir. Gastroenterol.* 8(3):264-276, 1974.

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5967 SIGMOID VOLVULUS ASSOCIATED WITH OTHER DISEASES. *(Rus.)* Stegailov, R. A. (Monchegorsk Assoc. Munic. Hosp., Murmansk District, USSR). *Vestn. Khir.* 114(2):131-132, 1975.

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6007 COLONIC PSEUDOPOLYPS IN ASSOCIATION WITH AMEBIC COLITIS. *(E.)* Berkowitz, D.; Bernstein, L. H. (Montefiore Hosp., Bronx, N.Y.). *Gastroenterology* 68(4):786-789, 1975.

6008 DRUG-INDUCED COLITIS MIMICKING AN ACUTE SURGICAL CONDITION OF THE ABDOMEN. *(E.)* Tedesco, F. J.; Anderson, C. B.; Ballinger, W. F. (Washington Univ. Sch. Med., St. Louis, Mo.). *Arch. Surg.* 110(5):481-484, 1975.

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6010 LYMPHOGRANULOMATOSIS OF THE RECTO-SIGMOID REGION: A RARE PRIMARY MANIFESTATION AND LOCALIZATION.

(Ger.) Kuhlmann, H. W. (St. Jurgen's St. Central Hosp., Bremen, Germany). *Dtsch. Med. Wochenschr.* 100(11):553-554, 1975.

See also, 5622, 5623, 5658, 5671, 5679, 5692, 5698, 5768, 5775, 5799, 5868, 5870, 6061, 6099, 6204, 6395, 6520, 6522, 6552, 6558, 6575, 6577, 6590, 6591.

LARGE INTESTINE

Ulcerative Colitis

6011 ULCERATIVE COLITIS AND ANAPHYLACTOID PURPURA.

(E.) Craig, R. M.; Ashman, M.; Feldman, S.; Hasegawa, J. (Northwest. Univ. Med. Sch., Chicago, Ill.). *Am. J. Dig. Dis.* 20(5):487-493, 1975.

A 21-yr-old male was hospitalized after an episode of bloody diarrhea and abdominal cramping. Two flat erythematous patches developed on his legs 6 months later which were termed "erythema marginatum." Recurrent erythematous eruptions occurred, occaisionally associated with diarrhea and abdominal cramping. Ulcerative colitis was diagnosed. His history included several strep throats throughout his life which had been treated with penicillin. One month prior to hospitalization, his own physician put him on 16 mg methylprednisolone/day which was tapered to 4 mg/day. A proctoscopic examination after admission revealed multiple circumscribed erythematous lesions seen throughout the rectal mucosa. A biopsy of the rectum revealed small foci of mucosal hemorrhages and some acute inflammatory cells in the tunica propria mucosae. A skin biopsy revealed leukoclastic angiitis. Prednisone was administered at 30 mg/day, gradually tapering. During the 2 yr following this hospitalization, he had had exacerbations of his skin lesions, sometimes associated with watery or bloody diarrhea, so that the dose of prednisone had to be adjusted. During one of these episodes the patient was treated for possible tuberculosis and a lung biopsy was consistent with Loeffler's pneumonitis. The patient is now maintained on prednisone as an outpatient. This is the first case of well-documented ulcerative colitis occurring during exacerbations of anaphylactoid purpura. It is suggested that other patients with anaphylactoid purpura be carefully observed for evidence of ulcerative colitis.

6012 PULMONARY VASCULITIS AND ULCERATIVE COLITIS.

(E.) Forrest, J. A. H.; Shearman, D. J. C. (R. Infirm., Edinburgh, Scotland). *Am. J. Dig. Dis.* 20(5):482-486, 1975.

A 37-yr-old man was admitted with a 6 week history of intermittent bloody diarrhea, tenesmus, malaise, anorexia, and a weight loss of 21 lb. Bilirubin was 2.0 mg/100 ml, SGPT 136 U/ml, alkaline phosphatase 120 King-Armstrong U/100 ml. The provisional diagnosis was ulcerative colitis and cholangitis. The patient became dyspneic at rest 2 days later and developed a cough with blood-stained sputum. His temperature rose to 39 C. Prednisolone (60 mg/day) abated the fever, and the dyspnea disappeared within 24 hr. His chest x-ray, which had shown a bilateral pulmonary shadowing, improved greatly. His liver tests remained abnormal. The SGPT and alkaline phosphatase did not improve with intermittent courses of antibiotics. Biopsies taken at colonoscopy showed ulcerative colitis. He was readmitted with mild diarrhea 1 1/2 yr later and a chest x-ray was normal. A few days later he became febrile with an unproductive cough and the chest x-ray showed bilateral pulmonary shadowing, which again resolved with prednisolone in 72 hr. At this time sigmoidoscopy showed a moderate proctitis. That the lung lesion responded promptly to corticosteroids, and that the lesion recurred, ruled out the diagnosis of subacute fibrosing alveolitis. In this patient, repeated cytomegalovirus titers were normal over a 2-yr period, and rectal and liver biopsies showed none of the pathologic lesions characteristically produced by that virus. Although fibrosing alveolitis has been reported in association with chronic active hepatitis, this patient's liver pathology is one of a pericholangitis secondary to ulcerative colitis. Although a lung biopsy was not performed, the most likely explanation for the patient's lung lesion is that he suffered two episodes of pulmonary vasculitis which on each occasion coincided with a relapse of his ulcerative colitis. It is suggested that there should be greater awareness that ulcerative colitis patients may develop pulmonary disease, either associated with their colitis *per se*, or secondary to salazopyrine.

6013 ESTIMATION OF CARCINOEMBRYONIC ANTIGEN IN ULCERATIVE COLITIS WITH SPECIAL REFERENCE TO MALIGNANT CHANGE.

(E.) Dilawari, J. B.; Lennard-Jones, J. E.; Mackay, A. M.; Ritchie, J. K.; Sturzaker, H. G. (St. Mark's Hosp., London, England). *Gut* 16(4):255-260, 1975.

Carcinoembryonic antigen (CEA) levels in patients with colitis were investigated and the findings correlated with various clinical aspects of the disease. In particular, the question as to whether CEA levels could be correlated with the presence of carcinoma or of dysplastic epithelial changes without carcinoma was studied. A hospital control group was composed of 59 patients with the following diagnoses: idiopathic megacolon or Hirschsprung's disease (7), diverticular disease without inflammation (5), rectal prolapse (5), hemorrhoids (18), anal fissure (6), perianal hematoma (3), other anal conditions (4), and miscellaneous conditions (11). A second patient group consisted of 139 patients with uncomplicated ulcerative colitis, i.e., without evidence of dysplastic change in the rectal mucosa or carcinoma. A third patient group consisted of 7 patients with ulcerative colitis and epithelial dysplasia. The last patient group contained 7 individuals (6 men and 1 woman, aged 24-63 yr) with established carcinoma in ulcerative colitis. In a group of 70 healthy controls, all individuals had CEA levels of less than 17.5 ng/ml. These results are different from those in the hospital control group where 8 of the 59 patients had values higher than 17.5 ng/ml with a range of from 1 to 36 ng/ml. Generally, there was little difference in the results for patients with colitis and those in the hospital control group. In the colitic patients no correlation could be established between the actual CEA levels and the age of the patient, the activity of the disease, or the extent of involvement. Only 1 patient among the 7 with dysplastic changes in the rectal mucosa had a CEA level above the values found in the hospital control group. One patient among the 7 with malignant change had a CEA level of 105 ng/ml; the other 6 patients, including one with recurrent growth and peritoneal metastases, all had CEA values within the range of the hospital control group. Thus, the results of this study show that CEA values in ulcerative colitis have no correlation with length of history, extent of disease, or degree of activity. It is unlikely that malignant change would be detected by this test earlier than by other methods of investigation. It is not recommended that routine CEA examinations be performed on patients with ulcerative colitis.

6014 CARCINOEMBRYONIC ANTIGEN IN PATIENTS SUFFERING FROM ULCERATIVE PROCTOCOLITIS.

(E.) Mitchell, A. B. S.; Gill, A. M.; Orchard, R. T.; Parkins, R. A. (Prince of Wales's Hosp., London, England). *Am. J. Dig. Dis.* 20(5):407-417, 1975.

Carcinoembryonic antigen (CEA) was measured by radioimmunoassay in blood samples obtained from all 59 patients with ulcerative proctocolitis seen within a 4-month period. The characteristics of this group of patients were compared with reported epidemiological studies in this disease. The current patients had a similar sex ratio and age of onset as those in other studies, but the extent of their disease was more limited. Among these 59 patients, 11 had elevated circulating CEA values. One of the 11 had a colonic carcinoma and another was pregnant. Excluding these two patients, the overall prevalence of elevated CEA levels was 17.5%. The prevalence in ulcerative proctitis was 7.1%, and in colitis was 19.9%. The patients with elevated plasma CEA values were compared with remaining patients in relation to factors known to be associated with an increased propensity for the development of colorectal carcinoma complicating ulcerative colitis. There was no difference in mean age of the patients at disease onset, nor was there any difference in disease duration, extent, and control. A significant correlation was found, however, between elevated plasma CEA levels and the severity of the initial attack. Accordingly, a significantly greater proportion of those with normal CEA concentrations, as compared with those with elevated CEA concentrations, had suffered a mild onset of ulcerative proctocolitis. One patient with premalignant changes in the rectal mucosa had consistently normal concentrations of plasma CEA. There was no significant correlation between elevated plasma CEA values and disease activity. The mean age of the 2 groups of patients was similar. During follow-up periods of at least 18 months no carcinoma has manifested in any patient. The significance of the elevated levels of circulating CEA in patients who suffer from ulcerative proctocolitis and do not have evidence of carcinoma cannot be decided at present. The raised CEA levels can only be regarded as genuine false positives in the detection of colorectal carcinoma should this complication eventually be found with the same frequency among those with normal and those with elevated circulating CEA levels.

6015 CARCINOMA AND EPITHELIAL DYSPLASIA COMPLICATING ULCERATIVE COLITIS.

(E.) Cook, M. G.; Goligher, J. C. (Gen. Infirm. Leeds, England). *Gastroenterology* 68(5):1127-1136, 1975.

The pathology of 19 specimens of carcinoma complicating ulcerative colitis was reviewed with particular attention given to the incidence of epithelial dysplasia. The 19 patients (aged 28-74 yr) had a history of colitis ranging from 3-34 yr in duration. The carcinomas were more frequently multiple, more evenly distributed in the large intestine, and much more often of atypical macroscopic appearances and of mucoid histological type than ordinary colorectal carcinomas, but the proportion of poorly differentiated tumors complicating ulcerative colitis was not as high as had been previously reported. Of these 19 patients, 26% are alive and well at least 5 yr after surgery. Unequivocal epithelial dysplasia was demonstrated in some part of the large intestine in 15 of 19 specimens with colitis carcinoma, but was also found in 4 of 14 specimens from a "control" series of patients with longstanding total colitis but without carcinoma. Therefore, the finding of dysplasia in a rectal biopsy of a patient with colitis is not a reliable guide to the presence of a frank carcinoma elsewhere in the intestine. Whether such a finding may indicate a predisposition to the development of a growth in the future cannot be determined from the data of this study. When present in colitis, epithelial dysplasia is often patchy in distribution and frequently spares the rectum even in patients with definite carcinomas; this makes a negative rectal biopsy particularly unreliable in deciding on the absence of a tumor or the lack of predisposition to its development. It is suggested that multiple biopsies from different parts of the colon as well as the rectum are desirable if mucosal sampling is to be employed as a screening test.

6016 MONOAMINE OXIDASE ACTIVITY IN PATHOLOGICALLY CHANGED TISSUE OF THE LARGE INTESTINE.

(Pol.) Matuszewski, W.; Kalina, Z.; Kaminski, K.; Foremny, Z. (Inst. Biol.-Physiol., Silesian Med. Acad., Katowice, Poland). *Pol. Tyg. Lek.* 29(46): 1973-1974, 1974.

6017 LONG-TERM FOLLOW-UP OF PSYCHIC AND SOMATIC FACTORS IN PATIENTS WITH ULCERATIVE COLITIS. *(Ger.)* Feiereis, H.; Schroter, D. (Med. Coll., Lubeck, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:557-560, 1974.

6018 CLINICAL ASPECTS OF THE PHYSICIAN-PATIENT-RELATIONSHIP: A CASE OF ULCERATIVE COLITIS. *(Ger.)* Lohmann, R. (Med. Clin., Univ. Koln, Germany). *Leber Magen Darm* 4(3):93-98, 1974.

6019 DRUG THERAPY. SULFASALAZINE. *(E.)* Goldman, P.; Peppercorn, M. A. (Harvard Med. Sch., Boston, Mass.). *N. Engl. J. Med.* 293(1):20-23, 1975.

6020 NONSPECIFIC ULCERATIVE COLITIS. *(E.)* Tanga, M. R.; Prat, Y. J.; Ewing, J. B. (Ottawa Gen. Hosp., Canada). *Indian J. Surg.* 36(2):68-71, 1974.

6021 LEUKAEMOID REACTIONS ASSOCIATED WITH FULMINATING ULCERATIVE COLITIS. *(E.)* Colvin, B. T.; Suggett, A. J.; Lancaster-Smith, M. J.; Fisher, D. J. H. (London Hosp., England). *Postgrad. Med. J.* 51(593):178-180, 1975.

6022 EVALUATION OF GUT MICROFLORA DURING ADMINISTRATION OF AN ELEMENTAL DIET IN A PATIENT WITH AN ILEOPROCTOSTOMY. *(E.)* Dickman, M. D.; Chappelka, A. R.; Schaedler, R. W. (US Naval Hosp., Philadelphia, Pa.). *Am. J. Dig. Dis.* 20(4):377-380, 1975.

6023 THE TREATMENT OF ULCERATIVE COLITIS WITH SULPHASALIZINE. *(E.)* Eastwood, M. A.; Das, K. M. (Western Gen. Hosp., Edinburgh, Scotland). *Br. J. Hosp. Med.* 13(2):142-144, 149, 1975.

See also, 5622, 5956, 5973, 6505, 6523, 6580, 6581, 6585.

PANCREAS

6024 ELECTROPHORETIC PATTERNS OF ALKALINE PHOSPHATASE ISOENZYMES IN HUMAN SERA WITH ABNORMALLY HIGH ACTIVITY, AND AN UNUSUAL BAND OBSERVED IN SERA OF PATIENTS WITH PANCREATIC CANCER. *(E.)* Cha, C. J. M.; Mastrofrancesco, B.; Cha, S.; Randall, H. T. (Rhode Island Hosp., Providence). *Clin. Chem.* 21(8):1067-1071, 1975.

The separation by electrophoresis of the isoenzymes of alkaline phosphatase on cellulose acetate membranes and an unusual alkaline phosphatase band observed in sera from patients with pancreatic cancer is reported. Alkaline phosphatase isoenzymes in sera were resolved into seven different bands: L_1, B_1, Pl, L_2, I_1, I_2 and Pa, in decreasing order of electrophoretic mobility. The slowest moving band (Pa) was observed in the sera of 16 patients, 15 with pancreatic cancer and one with hemochromatosis. Sera of 50 other patients with malignant or benign diseases did not show the Pa band. The Pa band was more heat labile than the liver isoenzyme (L_1). The behavior of the Pa band toward inhibitors (L-phenylalanine and L-homoarginine) was similar to that of L_1. Sera containing the Pa band exhibited a diffuse band in the region where isoenzymes of intestinal origin migrate; however, its heat stability and stereospecific inhibition were different from those of intestinal isoenzymes in sera showing no Pa band. It is suggested that further studies be carried out to determine whether the 'slow-moving' bands observed by different studies are identical, and to establish the diagnostic value and the cellular origin of the serum Pa band.

6025 ASSOCIATION OF POLYARTHRITIS, SUBCUTANEOUS NODULES, AND PANCREATIC DISEASE. *(E.)* Tannenbaum, H.; Anderson, L. G.; Schur, P. H. (Robert B. Brigham Hosp., Boston, Mass.). *J. Rheumatol.* 2(1):14-20, 1975.

A patient with polyarthritis, panniculitis, and pancreatic carcinoma was given metabolic and immunologic tests to find a relation between the joint, skin and pancreatic lesions. A 63-yr-old white male presented with migratory polyarthritis of 2 months duration. Tender skin nodules developed over the right tibia and both malleolar areas of the right ankle 2 weeks prior to admission. These nodules were indurated, warm, and erythematous. There was a history of granulomatous prostatitis and diabetes mellitus. Aspiration of the arthritic left knee yielded a clear serous fluid, but a second aspiration after 6 days yielded a thick creamy synovial fluid containing fat globules. Needle aspiration from the fluctuant subcutaneous tissue of a nodular lesion yielded a brown viscous fluid containing similar fat globules. Both this and the synovial fluid contained small, negatively birefringent, rectangular particles between the fat globules. Skin biopsy revealed a marked neutrophilic infiltrate involving subcutaneous tissue and deep dermis, with extensive focal liquifaction-type necrosis, focal chronic inflammation, scattered foam cells, and fibrinoid necrosis of small vessel walls. Liver biopsy revealed a metastatic undifferentiated tumor. The left knee effusion reaccumulated within 2 days, and new areas of synovitis and panniculitis appeared. Prednisone (60 mg/day) controlled the arthritis but not the panniculitis. Chemotherapy with bleomycin, adriamycin, cyclophosphamide, oncovin, and prednisone for the tumor also resolved the panniculitis but the patient died shortly after. Autopsy revealed a well-differentiated acinar cell carcinoma in the tail of the pancreas. Lungs showed interstitial thickening with fibrosis and edema. The serum contained elevated lipase levels of 11.9-12.3 Cherry-Crandall U. The creamy joint fluid had a fatty acid of 26mg%, glycerol 41 mg%, and triglyceride 48mg%; there were 2122 M lactate/liter. Skin biopsy from a panniculitis area showed no immunoglobulins or complement. Lymphocytes failed to take up ^{3}H-thymidine when exposed to non-specific mitogens, tuberculin, or streptokinase/streptodornase, but did respond to *Candida albicans*. Blood immunoglobulins, gamma G subclasses, hemolytic complement, and complement components were normal. Radioimmunoassay for the carcinoembryonic antigen was positive (18.5 ng/ml). It is concluded that lipolysis and immunologic mechansims are not involved in the pathogenesis of this disease.

6026 IMMUNOGLOBULIN CHARACTERIZATION OF HUMAN PANCREATIC FLUID. *(E.)* Brasher, G. W.; Dyck, W. P.; Hall, F. F.; Spiekerman, A. M. (Scott White Clin., Temple, Texas). *Am. J. Dig. Dis.* 20(5): 454-459, 1975.

The concentration and stability of pure pancreatic fluid immunoglobulins were studied in two patients with traumatic pancreatic fistulae. Single radial diffusion demonstrated that the fluid of both patients contained detectable levels of IgG and IgA. IgD and IgM were found in 1/3 of the random samples in concentrations of 2.0-2.5 mg/100 ml, and 5-7 mg/100 ml, resp. One random specimen contained 216 U/ml IgE. One patient had 15 mg/100 ml IgG, 3.6 mg/ml IgA, 2.8 mg/100 ml IgM, and less than 0.9 mg/100 ml IgD. The IgG:IgA ratio ranged from 0.65-4.70. IgA molecular weight was estimated at 155,000 daltons by gel-filtration column chromatography. There was a progressive decay of all immunoglobulin fractions during storage at 4 C. By 10 days, no immunoprecipitates could be detected, while proteolytic activity had progressively increased. It is concluded that the five major immunoglobulins are present in human pancreatic fluid.

6027 EVALUATION OF BILIARY AND PANCREATIC FUNCTION IN PANCREOLITHIASIS: VALUE OF THE DETERMINATION OF γ-GLUTAMYL TRANSPEPTIDASE. *(E.)* Nakajima, S.; Noda, A.; Toda, Y. (Nagoya Hoden Eisei Univ. Sch. Med., Japan). *Arch. Intern. Med.* 135(6):829-831, 1975.

The pancreozymin-secretin test was used to determine γ-glutamyl transpeptidase, bile pigment, amylase concentrations and volume of duodenal aspirate. Patients with pancreolithiasis (10) and 10 controls had a triple lumen tube with two balloons, positioned fluoroscopically in the third portion of the duodenum after an overnight fast. A skin test with pancreozymin was performed at the beginning of each test. A quantitative duodenal aspirate was obtained for two 10 min control periods after the aspirate became alkaline. Then, 1 CHR U/kg pancreozymin was injected i.v. and three additional samples of aspirate were collected at 10 min intervals. Secretin (1 CHR U/kg) was then injected i.v., and six more 10 min samples were collected. Blood specimens were taken immediately before the hormone injections, and 30 and 60 min after the secretin. Routine liver function tests and drip infusion cholangiography in all patients showed normal results. The concentrations and outputs of γ-glutamyl transpeptidase in response to the two hormones were significantly greater in the patients than in the controls. There was no correlation between the enzyme and the bile pigment concentrations. Mean amylase outputs in pancreolithiasis patients were significantly less than those of controls, but secretion was not impaired in the form of the disease with bulky calculi in the head of the pancreas. Pancreozymin-secretin stimulation produced no increase above the normal levels of 40 mU/ml for serum γ-glutamyl transpeptidase and 200 U/100 ml for amylase, in the controls. In the patients, the provocative serum enzyme test was positive (rising to at least twice the initial values) in 3 for transpeptidase and in 1 for amylase. It is concluded that γ-glutamyl transpeptidase in posthormonal aspirates is significantly greater in patients than in controls.

6028 PANCREATIC CHOLERA (W.D.H.A. SYNDROME): HISTOCHEMICAL AND ULTRASTRUCTURAL STUDIES. *(E.)* Rambaud, J. C.; Galian, A.; Scotto, J.; Hautefeuille, P.; Matuchansky, C.; Modigliani, R.; Pessayre, D.; Bernier, J. J. (Hosp. St.-Lazare, Paris, France). *Virchows Arch.* [*Pathol. Anat.*] 367(1):35-45, 1975.

A detailed histochemical and ultrastructural study was made of a pancreatic tumor in a case of pancreatic cholera. A 38-yr-old woman presented with acute dehydration and anuria. There was a 7-yr history of recurrent diarrhea and a 2-yr history of five progressive quadriplegic attacks. Laboratory findings showed hypokalemia (1.8 mEq/liter), high fecal water and potassium losses (3270 ml/day and 160 mEq/liter/day, resp.), and basal gastric achlorhydria. Laparotomy showed a tumor of the body of the pancreas with multiple small metastases on the liver, peritoneum, and ovaries. The tumor was resected, and radioimmunoassay and bioassay showed large amounts of vasoactive intestinal peptide and a small amount of glucagon. The primary tumor, but not the metastases, contained large cysts lined in some places by small intestine-like epithelium and in other areas by cells similar to pancreatic duct cells. These exocrine-like structures were closely connected with endocrine cells, suggesting a mixed tumor. Apart from a few D cells, the endocrine tumor cells could not be identified by histochemical stains. Ultrastructurally the cells resembled gastric and duodenal D1 cells in that they contained small secretory granules (diameter less than 300 nm) and numerous cytoplasmic bundles of filaments. No intermediate cells containing both zymogen and endocrine-like granules were found in the tumor. Lymph node, liver, and peritoneal metastases were composed exclusively of endocrine cells. Normal duodenal D1 cells have been reported to produce gastric inhibitory peptide, a substance structurally and biologically similar to the vasoactive intestinal peptide secreted by the tumor. Histological patterns were normal in the gastric, gallbladder, jejunal, ileal, and right and left colonic mucosa. This strongly suggests that a humoral agent (possibly vasoactive intestinal peptide) secreted by the pancreatic tumor is responsible for impaired intestinal function and abnormalities in gastric juice and gallbladder bile composition in pancreatic cholera.

6029 PANCREATIC SECRETION IN PERNICIOUS ANEMIA. *(E.)* Dreiling, D. A.; Greenstein, A. J. (Mt. Sinai Sch. Med., New York, N.Y.). *Am. J. Gastroenterol.* 63(6):495-497, 1975.

This report presents data from standard secretin tests performed on 257 control subjects, 19 patients with pernicious anemia, 67 patients with atrophic gastritis with achlorhydria, and 11 patients with Zollinger-Ellison syndrome. Gross inspection of the data from pernicious anemia patients indicates that 7 of the 19 secreted water and bicarbonate in the hypersecretory range. The increased secretion in pernicious anemia patients is consistent for flow, bicarbonate output, and amylase production. Patients with atrophic gastritis showed average responses similar to those with pernicious anemia. However, the increases in secretion in pernicious anemia and atrophic gastritis were not of the order of magnitude of those seen in Zollinger-Ellison syndrome and were not statistically significant. Preliminary observations on serum gastrin levels and their response to secretin indicated that levels are very high in pernicious anemia and atrophic gastritis. However, the gastrin is "Big Big" gastrin in contrast to the lower molecular gastrins found in Zollinger-Ellison syndrome. Moreover, the gastrin level in pernicious anemia and atrophic gastritis does not respond excessively to secretin as observed in the Zollinger-Ellison syndrome. These data suggest that the pancreatic parenchyma in pernicious anemia and atrophic gastritis may be responding to the hypergastrinemia of these conditions but at a minimal level consistent with the relatively inactive form in which the gastrin, "Big Big" gastrin, is secreted into the blood. Alternatively, the increased flow, bicarbonate output, and enzymes secretion may result from the synergism between the increased but relatively inactive serum gastrin and the endogenous secretin stimulus.

6030 VASCULARIZATION OF THE PANCREAS AFTER GASTRIC SURGERY. *(Ger.)* Barke, R.; Schulz, H. G. (Dep. Med., Karl Marx Univ., Leipzig, Germany). *Radiol. Diagn. (Berl.)* 15(1):13-20, 1974.

To study the effect of gastrectomy on vascularization of the pancreas, combined selective angiography of the celiac and mesenteric arteries was performed on four patients 2 to 6 yr after they had undergone Billroth II procedures for peptic ulcer. Three of these patients had undergone total orad antecolic resections with ligation of the right gastroepiploic artery close to the duodenum; in some cases the gastroduodenal or pancreaticoduodenal arteries were included. The left gastroepiploic artery was also ligated, so that only the left gastric artery supplied the gastric stump. Selective celiac angiography showed postoperative hypoplasia of the gastroduodenal artery in a 46-yr-old man who had undergone surgery 3 yr before for an ulcer of the anterior wall of the duodenum; the superior posterior and superior anterior pancreaticoduodenal arteries and the right gastroepiploic artery were not visualized. The transverse pancreatic artery was very small and the left gastric artery was relatively small. Combined selective celiac and superior mesenteric angiography in a 45-yr-old man, who had undergone gastrectomy 2 yr before for a recurrent duodenal ulcer, revealed a normal pancreaticoduodenal arcade due to careful ligation of the right gastroepiploic artery. In a 47-yr-old man who had undergone surgery 6 yr before for an ulcer of the anterior wall of the duodenum, combined angiography demonstrated some hypoplasia of the gastroduodenal artery; upper jejunal branches were drawn up from the superior mesenteric artery. Some branches of the pancreatic artery to the posterior body of the pancreas were also detected. The pancreaticoduodenal arcades were normal in a 35-yr-old man who had undergone a Billroth II gastroenterostomy with a retrocolic anastomosis 5 yr before, surgery for a gastrojejunocolonic fistula 2 yr before, conversion of the retrocolic into an antecolic anastomosis, repeated gastrectomy for an anastomotic ulcer 1 yr before, and resection for a perforated jejunal ulcer 6 months before. A large pancreatic artery, from which the transverse pancreatic artery originated, provided a very good blood supply to the head of the pancreas. The right hepatic artery originated from the proximal trunk of the superior mesenteric artery. In this case, a variation in the course of the right gastroepiploic artery apparently made a good pancreatic blood supply possible. It is concluded that disorders in pancreatic function in gastrectomized patients may be attributed to a decreased pancreatic blood flow.

6031 MORPHOLOGICAL PATTERNS OF PRIMARY NONENDOCRINE HUMAN PANCREAS CARCINOMA. *(E.)* Cubilla, A. L.; Fitzgerald, P. J. (Mem. Sloan Kettering Cancer Cent., New York, N.Y.). *Cancer Res.* 35(8):2234-2248, 1975.

6032 CYSTADENOMA OF THE PANCREAS. *(E.)* Didolkar, M. S.; Malhotra, Y.; Holyoke, E. D.; Elias, E. G. (Roswell Park Mem. Inst., Buffalo, N.Y.). *Surg. Gynecol. Obstet.* 140(6):925-928, 1975.

6033 IMMUNOLOGY, TUMOR MARKERS, AND PANCREATIC CANCER. *(E.)* Zamcheck, N. (Boston City Hosp., Mass.). *J. Surg. Oncol.* 7(2):155-165, 1975.

6034 CARCINOMA OF THE HEAD OF THE PANCREAS DEVELOPING IN A YOUNG WOMAN WITH A CHOLEDOCHAL CYST. *(E.)* Wood, C. B.; Baum, M. (Welsh Nat. Sch., Med., Cardiff, Wales). *Br. J. Clin. Pract.* 29(6):160-162, 1975.

6035 ISOLATED GASTRIC VARICES--A HINT OF PANCREATIC DISORDERS. *(E.)* Rosch, W. (Dep. Med., Univ. Erlangen, Nuremberg, Germany). *Endoscopy* 6(4):217-220, 1974.

6036 PANCREATIC PSEUDOCYST WITH HEMORRHAGE INTO THE GASTROINTESTINAL TRACT THROUGH THE DUCT OF WIRSUNG. *(E.)* Lam, A. Y.; Bricker, R. S. (Washington Univ. Sch. Med., St. Louis, Mo.). *Am. J. Surg.* 129(6):694-695, 1975.

6037 HEMOCOAGULATION IN PATIENTS WITH CANCER OF THE PANCREAS BEFORE AND AFTER OPERATIVE INTERVENTION. *(Rus.)* Zhukovskaia, E. S.; Itin, A. B. (Inst. Exper. Clin. Oncol. Acad. Med. Sci. USSR, Moscow, USSR). *Sov. Med.* (2):78-81, 1975.

6038 HETEROTOPIC PANCREAS. *(Fr.)* Maffioli, C.; Kuntz, J. L.; Bonnet, D.; Coudoux, P.; Geoffroy, H. (Med. Clin. B, Reims, France). *Maroc Med.* 54(584):599-601, 1974.

6039 THE CLINICAL VALUE OF RETROGRADE PANCREATOGRAPHY FROM A SURGICAL VIEWPOINT. *(Ger.)* Endsberger, G. (Surg. Clin., Stuttgart-Bad Cannstatt, Germany). *Med. Welt* 26(5):179-181, 1975.

6040 A CASE OF CYSTADENOMA OF THE PANCREAS WITH INTERESTING ANGIOGRAPHIC FINDINGS. *(Jpn.)* Shinohara, M.; Hanyo, F.; Kobayashi, S.; Yamada, A.; Hamano, K.; Fujimoto, A.; Muto, H.; Ohi, I.; Imai, M.; Takada, T. (Tokyo Women's Hosp., Japan). *Rinsho Hoshasen* 19(12):959-965, 1974.

6041 PANCREATIC HYPERSECRETION IN A CASE WITH HEMOCHROMATOSIS. *(It.)* Gaia, E.; Croce, G.; Sategna, S. (S. Giovanni, Battista Greater Hosp., Turin, Italy). *Minerva Gastroenterol.* 20(2):60-61, 1974.

6042 CHRONIC PANCREATITIS AND CARCINOMA OF THE PANCREAS. *(Ger.)* Mohr, P.; Ammann, R.; Largiader, F.; Knoblauch, M.; Schmid, M.; Akovbiantz, A. (Kanton Hosp., Zurich, Switzerland). *Schweiz. Med. Wochenschr.* 105(18):590-592, 1975.

6043 THE PHYSIOLOGY AND PATHOPHYSIOLOGY OF FAT DIGESTION, ESPECIALLY IN REGARD TO PANCREAS FUNCTION. *(Ger.)* Erb, W. (Cent. Intern. Med., Univ. Frankfurt/Main, Germany). *Fortschr. Med.* 93(12):623-626, 1975.

6044 ABSCESSED PANCREATIC PSEUDOCYST OF A RARE LOCALIZATION. *(Rus.)* Beliaev, A. A.; Shindiaikin, A. P. (2nd Surg. Hosp., N. V. Sklifosovskii Res. Inst. First Aid, Moscow, USSR). *Vestn. Khir.* 114(4):117-119, 1975.

See also, 5628, 5629, 5631, 5639, 5646, 5664, 5665, 5666, 5672, 5673, 5689, 5690, 5702, 5816, 5833, 5847, 5865, 6046, 6048, 6058, 6069, 6397, 6469, 6519.

PANCREAS

Pancreatitis

6045 HEREDITARY PANCREATITIS. NONSPECIFICITY OF AMINOACIDURIA AND DIAGNOSIS OF OCCULT DISEASE. *(E.)* Riccardi, V. M.; Shih, V. E.; Holmes, L. B.; Nardi, G. L. (Massachusetts Gen. Hosp., Boston). *Arch. Intern. Med.* 135(6):822-825, 1975.

A family with hereditary pancreatitis involving males in five generations and the initial proband (originally diagnosed at 11 months) is reported in order to emphasize the marked phenotypic variation found in this disease, the ability to make a diagnosis in an asymptomatic individual, and the nonspecific nature of any associated aminoaciduria. Hereditary pancreatitis was diagnosed in four cases, twice based on clinical and surgical findings, once on back pain and pancreatic calcifications, and once by laboratory and x-ray film studies. Suspected hereditary pancreatitis was diagnosed four times, once from old medical records, and in three cases from descriptions provided by family members. The autosomal dominant nature of the disease in this family was evident from multiple generation involvement and the male-to-male transmission. The morphine prostigmine test and the hypotonic duodenogram were helpful in establishing the diagnosis. On the basis of 24-hr urinary amino acid excretion rates available from other cases, and from those in this family who were available, it is concluded that the aminoaciduria previously associated with this disorder is coincidental or nonspecifically related to acute pancreatic inflammation. An increased risk for pancreatic carcinoma was emphasized by the concern for that complication in the proband's grandfather. However, counseling regarding the risk for developing pancreatic carcinoma in hereditary pancreatitis in clearly affected and especially asymptomatic individuals at risk cannot be done until more information is available.

6046 CLINICAL TRIAL OF CDP-CHOLINE AS A MEDICAMENT FOR ACUTE PANCREATITIS AND ITS RELATION TO PANCREAS AND LIVER DAMAGE IN ACUTE PANCREATITIS. *(E.)* Ozawa, K.; Kitamura, O.; Uchida, K.; Honjo, I. (Fac. Med., Kyoto Univ., Japan). *Bull. Soc. Int. Chir.* 33(5/6):483-489, 1974.

In an attempt to understand some of the basic mechanisms involved in the induced ischemic state, changes of oxidative phosphorylation of the pancreas in acute pancreatitis were studied. Pancreas and liver mitochondria from guinea pigs were prepared; oxygen consumption was measured polarigraphically and phosphorylative efficiency was measured simultaneously with oxygen utilization by following pH changes with a glass electrode. Spectrophotometric techniques were used to assay respiratory enzymes. The maximal phosphorylation rate in brain and pancreas mitochondria declined rapidly, as compared to liver, kidney and heart mitochondria, where the initial rate of phosphorylation remained almost constant for 10 min. In pancreas mitochondria, state 3 respiration (with glutamate as the substrate) declined rapidly, whereas that with succinate plus glutamate was slightly affected, leading to a rapid decrease in the glutamate to succinate ratio to less than 1/3 of the original value 5 min after ischemia. The decrease in the glutamate to succinate ratio paralleled the fall in the lipid acyl ester bonds and a concomitant rise in lysolecithin. Administration of 15 mg/kg CDP-choline to 53 patients with pancreatitis showed a 60% amelioration of symptoms. It is concluded that CDP-choline prevents mitochondrial derangement due to aging-induced activation of phospholipase A.

6047 USE OF A PERITONEAL LAVAGE IN THE DIAGNOSIS OF EXPERIMENTAL ACUTE PANCREATITIS. *(E.)* Machiedo, G. W.; Brown, C. S.; Lavigne, J. E.; Rush, Jr., B. F. (Martland Hosp., New Jersey Med. Sch., Newark). *Surg. Gynecol. Obstet.* 140(6):889-892, 1975.

Additional biochemical parameters for the recognition of acute pancreatitis are presented, and how they can aid in the diagnosis of the disease is discussed. Dogs (24) were divided into five groups. Under sodium pentothal anesthesia, those in the control group underwent no further manipulation; another group underwent laparotomy only; and dogs in the last three groups had induced pancreatitis (injection of bile into the pancreas), intestinal ischemia and duodenal perforation, resp. Analysis was made of serum and peritoneal lavage fluid in a dog from each group at 30-min intervals for 4.5 hr. Parameters which were significantly elevated in dogs with pancreatitis compared with other groups included fluid amylase, LDH, proteolytic activity and intestinal alkaline phosphatase and serum amylase. It is concluded that these biochemical differences in the lavage fluid, when considered together with the physical characteristics of the fluid, can significantly aid the clinician in arriving at the diagnosis of acute pancreatitis.

6048 PANCREATIC FUNCTION TEST IN PATIENTS WITH BILLROTH II RESECTION WITH THE AID OF AN ENDOSCOPE. *(E.)* Tympner, F.; Rosch, W. (Dep. Med., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Endoscopy* 6(4):245-257, 1974.

A new method is presented which allows a quantitative pancreatic function test in patients with Billroth II resection. A Lagerlof tube and an endoscope with prograde optics was introduced without premedication and the tube was placed into the afferent loop under visual control. The procedure was successfully applied in 12 patients in whom retrograde pancreatography was also attempted. Comparison of pancreatograms and pancreatic secretion after secretin-pancreozymin stimulation showed that the function test is superior to radiology. While retrograde pancreatography produced successful results in only seven of the patients, a clinical diagnosis was obtained in all cases with the use of the pancreatic function test. Although there is a certain amount of annoyance to the patient without premedication, it is concluded that this test allows the clinician to gather valuable information in patients likely to have chronic pancreatitis, and in whom other procedures such as retrograde pancreatography are unsuccessful.

6049 A PATHOGENESIS FOR ALCOHOLIC PANCREATITIS. *(E.)* Cameron, J. L.; Zuidema, G. D.; Margolis, S. (Johns Hopkins Med. Inst., Baltimore, Md.). *Surgery* 77(6):754-763, 1975.

To determine whether increased serum triglyceride levels secondary to alcohol ingestion might play an important intermediary role in the initiation of pancreatitis, patients with prior episodes of alcoholic pancreatitis associated with hypertriglyceridemia were admitted to a metabolic ward and studied. Hypertriglyceridemia was induced by dietary means, in the absence of alcohol, in an attempt to reproduce the symptoms of pancreatitis. During a quiescent period in their diseases, 12 patients with prior alcoholic pancreatitis were studied. By lipid feeding (316-894 g/day), significant hypertriglyceridemia (greater than 600 mg/100 ml) was induced in 11 of the 12. Seven of these developed abdominal pain similar to but not as severe as that experienced during prior attacks of pancreatitis. Of these seven, four developed serum amylase elevation, and of the remaining three, one had a serum lipase elevation and one a urinary amylase elevation. It is suggested, on the basis of these and previous data, that increased serum triglycerides act as important intermediaries in the pathogenesis of acute pancreatitis in some alcoholic patients.

6050 LACTOFERRIN IN THE DUODENAL JUICE OF PATIENTS WITH CHRONIC CALCIFYING PANCREATITIS. *(E.)* Estevenon, J. P.; Sarles, H.; Figarella, C. (Dig. Pathol. Res. Unit., INSERM, Marseilles, France). *Scand. J. Gastroenterol.* 10(3):327-330, 1975.

Since lactoferrin is present in the pancreatic juice of patients with chronic calcifying pancreatitis, but has not been found in normal juice, its presence in pathological pancreatic juice was investigated for possible clinical significance. A technique for collecting human duodenal juice with a rubber tube and preventing its contamination with saliva is described. The presence of lactoferrin was investigated in the duodenal juice of 15 patients with chronic calcifying pancreatitis, 52 controls without evidence of pancreatic disease and nine cases of pancreatic disease other than chronic calcifying pancreatitis. Immunological methods were used to determine the presence of lactoferrin before and after an i.v. injection of cholecystokinin-pancreozymin (3 Crick-Harper-Raper U) plus secretin (1 CU). Tests for lactoferrin were positive in 11, negative in three, and inconclusive in one patient(s) with chronic calcifying pancreatitis. All nine patients with pancreatic disease other than chronic calcifying pancreatitis were negative for lactoferrin. Of the 52 controls, five were positive, six inconclusive, and 41 negative for lactoferrin. It is suggested that this test be used in the diagnosis of chronic calcifying pancreatitis.

6051 MAGNESIUM AND CALCIUM IN DUODENAL JUICE: SECRETION PATTERN IN CHRONIC PANCREATITIS AND IN PRIMARY HYPERPARATHYROIDISM. *(Ger.)* Baltzer, G.; Goebell, H.; Muller-Reinhardt, B. (Med. Clin., Phillipps Univ., Marburg/Lahn, Germany). *Klin. Wochenschr.* 52(2):74-79, 1974.

The secretion of magnesium (concentration and output) was measured in human duodenal juice before and after stimulation of the pancreas by secretin and pancreozymin (1 unit/kg) and compared with data for calcium. Subjects included 27 (12 women, 15 men, average age 49.9 yr) with normal pancreatic function; 23 patients (8 women, 15 men, average age 38.7 yr) with moderate and 22 patients (8 women, 14 men, average age 45.9 yr) with severe pancreatic insufficiency; and 14 (7 women, 7 men, average age 41.5 yr) with primary hyperparathyroidism. In all functional states of the normal pancreatic gland, magnesium and calcium were secreted in close positive correlation. The concentration was lowered after secretin. Pancreozymin increased both the concentration and the output of the two elements. The parallel secretion was also found, with few exceptions, in patients with pancreatic insufficiency. The secretion of both electrolytes was significantly reduced after pancreozymin with the lowered enzyme secretion. In primary hyperparathyroidism associated with normal pancreatic function a higher than normal concentration and output of magnesium and calcium after pancreozymin were measured. When enzyme secretion in these patients was disturbed, the secretion of the two electrolytes was reduced. In primary hyperparathyroidism the secretion of magnesium was more strongly stimulated by pancreozymin than that of calcium. The behavior of magnesium and calcium was no longer parallel in this case. Observations made in the analysis of enzyme fractions in five different phases of enzyme secretion in different phases of pancreatic stimulation suggest the possibility that the deviating behavior of magnesium is related to a preferred secretion of an enzyme protein.

6052 ALCOHOLIC HYALIN-LIKE BODIES FOUND IN THE PANCREATIC ACINAR CELLS AND NERVE CELLS OF THE BRAIN. *(E.)* Kojima, K. (Cent. Pathol., Kooseiren, Niigata, Japan). *Acta Pathol. Jpn.* 25(3):281-293, 1975.

The presence of alcoholic hyalin in pancreatic acinar cells and nerve cells of the caudate nucleus of the brain is reported. In a series of about 150 autopsy cases of alcoholics, hyalinoid body formation in acinar cells was demonstrated in 13. Of these 13, 2 also had hyalinoid bodies in the nerve cells of the caudate nucleus. Electron microscopy performed on the pancreatic tissue of 2 of the cases showed these bodies to have a fibrillar filamentous structure consisting of fine filaments in parallel alignment, and no limiting membrane. Each fibril was 65-379 Å in diameter. The hyalinoid bodies in the brain cells had the same fibrillar filamentous structure, with fibrils ranging from 53-155 Å in diameter. Some of the filaments showed periodicity of alternately arranged electron-dense particles of 130 Å and electron-lucent spaces of 50 Å. It is concluded that hyalinoid bodies found in pancreatic acinar cells and brain nerve cells of alcoholics greatly resemble the alcoholic hyalin in liver cells.

6053 IMMUNOLOGICAL PARTICIPATION IN CHRONIC CALCIFYING PANCREATITIS. *(E.)* Dani, R.; Antunes, L. J.; Ribeiro, J. E. F.; Nogueira, C. E. D.; Ribeiro, T. (Dep. Intern. Med., Fed. Univ. Minas Gerais, Belo Horizonte, Brazil). *Digestion* 11(5/6): 333-337, 1974.

Immunologic participation in chronic pancreatitis was studied in 12 patients with chronic calcifying pancreatitis and 20 healthy volunteers. Among the pancreatitis patients, 9 were alcoholic, 11 were diabetic, and 5 had steatorrhea; none was receiving steroids. Serum samples were studied by immunodiffusion, indirect immunofluorescence, and an anticomplementary technique; the percentage of peripheral blood lymphocytes was also determined. Compared with the controls, the mean serum concentrations of IgA and IgM were significantly elevated in the patients with chronic pancreatitis. One patient had autoantibodies against nuclear factors, smooth muscle, and IgG, 2 patients had autoantibodies to gastric parietal cells, and immune complexes were observed in 11 patients and none of the controls. The percentages of T-active and total T lymphocytes were significantly decreased in the pancreatitis patients, while the B lymphocyte levels were normal. These results suggest an immunologic participation in chronic calcifying pancreatitis, which might explain the persistence and progressive nature of the disease.

6054 AN ALTERNATE MECHANISM FOR THE FORMATION OF PROTEIN PLUGS IN CHRONIC CALCIFYING PANCREATITIS. *(E.)* Allan, J.; White, T. T. (Univ. Washington Sch. Med., Seattle). *Digestion* 11(5/6): 428-431, 1974.

To study the mechanism of protein plug formation in chronic calcific pancreatitis, protein precipitation in the ductal pancreatic juice was studied in specimens obtained after surgery on patients with varying types of pancreatic disease. Two general types of precipitation phenomena were observed. Concentration-dependent precipitation occurred when specimens of inactive pancreatic juice secreted at concentrations greater than 3 mg/ml were chilled on ice or stored at 4 C. The fine precipitates thus formed could be redissolved by warming at 37 C. With specimens containing active chymotrypsin, insoluble flocculent precipitates were formed even from dilute solutions; these precipitates did not redissolve on warming. Based on these results, it is suggested that the etiology of plug formation and calcification in the small and large ducts of patients with chronic calcifying pancreatitis is due to a series of partial activations of zymogens in the ductules; this process, which proceeds by an unknown mechanism, results in precipitate formation in localized regions of the pancreas with later spreading throughout the gland. The precipitates not washed out by the newly-secreted juice would enlarge and calcify *via* the absorption of proteins and salts from the pancreatic juice.

6055 SERUM ANTIBODIES IN HUMAN PANCREATIC DISEASE.

(E.) Lendrum, R.; Walker, G. (St. Mary's Hosp., London, England). *Gut* 16(5):365-371, 1975.

The presence of serum antibodies in human pancreatic disease was studied using immunofluorescent techniques. Serum samples from 61 patients with acute pancreatitis, 12 patients with relapsing acute pancreatitis, 14 patients with chronic pancreatic disease, 13 patients with pancreatic neoplasms, and 12 healthy adults were studied by indirect immunofluorescence using human pancreas as substrate; the positive sera were then retested after absorption with human RBC or human saliva. The positive sera were also tested against human pancreatic subfractions, human thyroid and stomach, rat liver and kidney, and rat and guinea pig pancreas. A reproducible pattern of immunofluorescence, consisting of a coarse granular appearance in the cytoplasm of the acinar cells, was obtained with the sera of 21 patients with acute pancreatitis, 3 of 381 patients without evidence of pancreatic disease, and 1 healthy adult. Absorption of the positive sera with A, B, or O blood cells or with saliva of the 3 Lewis phenotypes had no effect on the immunofluorescence reactions. The immunoglobulin classes of the antibodies in the positive sera were IgG in 1 patient, IgA in 7 patients, IgG and IgA in 13 patients, IgM in 1 control, and IgG in the other 3 controls. Complement fixation was demonstrated in only 1 of 15 positive sera. The positive sera gave no consistent or characteristic pattern when tested against human thyroid and stomach, and against rat liver and kidney; the results of the tests for species specificity were inconclusive. Tissue fractionation and absorption studies indicated that the antigen involved was located in the microsomal pancreatic fraction and that it may have been organ specific. The precise nature of the antigen is unclear, although it is unlikely that it is an enzyme.

6056 PANCREATITIS FOLLOWING INTESTINAL BYPASS FOR OBESITY.

(E.) Sorrell, V. F.; Knight, D. H.; Burcher, S. K. (Middlemore Hosp., Auckland, Australia). *Aust. N. Z. J. Surg.* 45(2):163-167, 1975.

Of 24 patients operated on for massive obesity, 16 underwent end-to-end 10"-10" jejunoileal bypass with drainage of the excluded small bowel into the transverse colon. If the gallbladder was found abnormal at surgery, cholecystectomy was carried out. There were three patients (two men and one woman, aged 31 to 39 yr) who developed the severe complication of pancreatitis in the postoperative phase. One patient developed severe upper abdominal pain which was diagnosed as acute pancreatitis; he recovered over a 10 day period. By dietary modifications and the elimination of alcohol, he remained well over a 12-month follow-up. The second patient to develop this complication died. Autopsy revealed hemorrhagic pancreatitis and retroperitoneal necrosis in the remnant of pancreas, with severe fatty degeneration of the liver. There was chronic cholecystitis, and several multifacetted stones in the gallbladder. His bile had been lithogenic two weeks prior to death. The third patient developed acute pancreatitis 5 months after the bypass surgery. Conservative treatment was used. One month later a cholecystogram revealed a nonfunctioning gallbladder with stones; a cholecystectomy was performed. Liver biopsies at the time of bypass surgery revealed mild to moderate fatty changes in these patients, and palpation of the gallbladders at the initial surgery suggested they were normal. If it can be shown that this complication is directly related to the intestinal bypass procedure used and not to preexisting gallbladder disease, then it is suggested that this method be dropped in favor of a less drastic bypass procedure.

6057 HYPERLIPOPROTEINEMIA AND ACUTE PANCREATITIS.

(Sp.) Carmena, R.; Ascaso, J.; Ferrando, J.; Fornes, J.; Gonzales-Bayo, E.; Bort, J. (Med. Fac., Valencia, Spain). *Rev. Esp. Enferm. Apar. Dig.* 45(3):269-280, 1975.

Case reports are presented for six patients (four women and two men, aged 23-63 yr) with acute pancreatitis associated with hyperlipoproteinemia. Acute pancreatitis was diagnosed on the basis of clinical symptoms and significantly increased serum amylase activities (four cases). In two patients, blood lipid levels were so high that they interfered with serum amylase determinations and false negative results were obtained; pancreatitis was diagnosed by increased urinary amylase activities in these two cases. Cholelithiasis was diagnosed in two patients; none were alcoholics. Familial hyperlipoprotenemia was present in three patients, two of whom were siblings. One female sibling had had five episodes of acute pancreatitis during the 4 yr previous; three of these episodes occurred during pregnancy. She was placed on a low-fat diet to prevent recurrences. Primary hyperlipidemia was diagnosed in four patients and secondary hyperlipidemia in two. The two patients with secondary forms had type V hyperlipidemia which disappeared 8 days after hospitalization. Determination of serum lipid fractions during the attack of acute pancreatitis showed that all six patients had increased serum cholesterol, triglyceride, phospholipid, and total lipid concentrations; chylomicrons were detected in three cases. Electrophoresis revealed that hyperlipidemia was type IV in two cases, type V in three and type II B in one. In addition to acute pancreatitis and hyperlipoproteinemia (type V), one patient was obese and had a familial form of diabetes which had been diagnosed 9 yr previously; 1 yr before admission he had had a myocardial infarction and an episode of acute pancreatitis. All patients responded to conservative therapy (nasogastric aspiration, parenteral fluids, analgesics, broad-spectrum antibiotics, etc.).

6058 ON THE TREATMENT OF COMPLICATED PANCREATIC CYSTS. *(Rus.)* Forafonova, L. N.; Kuzmina, N. A. (Regional Hosp., Aktyu Ginsk, USSR). *Sov. Med.* (2):81-85, 1975.

6059 CALCAREOUS PANCREATITIS. *(Rus.)* Tuzhilin, S. A.; Neporent, M. I. (I. M. Sechenov First Moscow Med. Inst., USSR). *Sov. Med.* (2):91-96, 1975.

6060 COMPLICATIONS OF ACUTE NECROTIZING PANCREATITIS. *(Cz.)* Podzimek, A.; Manhal, J.; Kubicek, V.; Schuck, M. (Surg. Clin., Fac. Med., Charles Univ., Plzen, Czechoslovakia). *Sb. Lek.* 77(2):58-64, 1975.

6061 A RARE COMPLICATION OF PANCREATITIS: STENOSIS OF THE COLON. *(Sp.)* Cantallops, J. G.; GilGrande, L. A.; Hernandez-Guio, C.; Melero Calleju, E.; Miranda Baiocchi, R. (Jimenez Diaz Found., Madrid, Spain). *Rev. Clin. Esp.* 134(3):291-294, 1974.

6062 ACUTE PANCREATITIS IN OLD AGE. REVIEW OF 35 CASES. *(Sp.)* Segura, J. M.; Perez Jimenez, F.; Cano, J. M.; De Dios, J. F.; Muro, J.; Ortiz Vazquez, J. (La Paz Munic. Sanit. Soc. Secur., Madrid, Spain). *Rev. Esp. Enferm. Appar. Dig.* 45(4):399-408, 1975.

6063 NEW CONCEPT IN CONSERVATIVE AND SURGICAL THERAPY OF ACUTE PANCREATITIS. *(Ger.)* Schonborn, H.; Pross, E.; Olbermann, M. (Med. Clin. II, Univ. Mainz, Germany). *Internist (Berlin)* 16(3):108-115, 1975.

6064 THE EFFECT OF ELASTASE INHIBITORS ON THE COURSE OF HEMORRHAGIC PANCREATITIS. *(Rus.)* Levitskii, A. P.; Stefanov, A. V.; Veretennikov, A. L. (Izhevsk Med. Inst., USSR). *Patol. Fiziol. Eksp. Ter.* (6):57-60, 1974.

6065 THE EFFICACY OF TRASYLOL IN THE TREATMENT OF ACUTE PANCREATITIS. *(Ger.)* Haberland, G. L. (Pharmaceut. Res. Cent., Bayer AG, Wuppertal, Germany). *Med. Welt* 25(50):2112-2117, 1974.

6066 INTRA-CYSTIC HAEMORRHAGE: A COMPLICATION OF PSEUDOCYST OF THE PANCREAS. *(E.)* Cordero, O. C.; Khademi, M.; Lazaro, E.; Swaminathan, A. P. (New Jersey Med. Sch., Newark). *Br. J. Radiol.* 48(571):602-603, 1975.

6067 RENAL CYST CAUSING AFFERENT LOOP OBSTRUCTION AND ACUTE PANCREATITIS. *(E.)* Bubrick, M. P.; Hitchcock, C. R. (Hennepin County Gen. Hosp., Minneapolis, Minn.). *Am. Surg.* 41(7):440-443, 1975.

6068 APPRAISAL OF OPERATIVE TREATMENT FOR CHRONIC PANCREATITIS: WITH SPECIAL REFERENCE TO SIDE TO SIDE PANCREATICOJEJUNOSTOMY. *(E.)* Sato, T.; Saitoh, Y.; Noto, N.; Matsuno, K. (Tohoku Univ. Sch. Med., Sendai, Japan). *Am. J. Surg.* 129(6):621-628, 1975.

6069 REACTIVE DUODENAL CHANGES IN CHRONIC PANCREATITIS SIMULATING CONTIGUOUS SPREAD OF PANCREATIC CARCINOMA. *(E.)* Blackstone, M. O.; Mizuno, H. (Dep. Med., Univ. Chicago, Illinois). *Gastrointest. Endosc.* 21(4):184, 1975.

6070 CARDIOVASCULAR LESIONS IN PANCREATITIS. *(E.)* Tuzhilin, S. A.; Dreiling, D. A. (Mt. Sinai Sch. Med., New York, N. Y.). *Am. J. Gastroenterol.* 63(5):381-388, 1975.

6071 HEMORRHAGIC PANCREATITIS WITH DUODENOPANCREATIC FISTULA IN A RENAL HOMOGRAFT PATIENT. *(E.)* Peitzman, S.; Agarwal, B. N. (VA Hosp., Philadelphia, Pa.). *Am. J. Gastroenterol.* 63(5):420-422, 1975.

6072 ULTRASTRUCTURAL STUDIES OF HUMAN ACUTE PANCREATITIS. *(E.)* Taura, S.; Tsunoda, T.; Yoshino, R.; Akashi, M.; Ito, T.; Tsuchiya, R.; Takebayashi, S. (Nagasaki Univ. Sch. Med., Japan). *J. Clin. Electron Microsc.* 7(3-4):347-348, 1974.

6073 INDICATIONS FOR THERAPY WITH PROTEINASE INHIBITORS IN SURGERY. CLINICAL AND ANIMAL EXPERIMENTS. *(Ger.)* Eckert, P.; Riesner, K.; Doehn, M. (Univ. Hosp., Hamburg-Eppendorf, Germany). *Med. Welt* 25(51/52):2154-2157, 1974.

6074 SEROTONIN CONTENT IN EXPERIMENTAL PANCREATITIS. *(Rus.)* Bagratuni, B. E. (Yerevan Inst. Grad. Med. Studies, USSR). *Zh. Eksp. Klin. Med.* 15(2):30-34, 1975.

6075 SUCCESS WITH EARLY OPERATION IN ALTERING THE COURSE OF PANCREATIC INFLAMMATORY LESIONS. *(E.)* Haff, R. C.; Torma, M. J.; Capps, Jr., W. F. (Wilford Hall USAF Med. Cent., Lackland Air Force Base, Tex.). *Am. Surg.* 41(7):436-439, 1975.

6076 NEW PALPATION TECHNIQUE FOR THE PANCREAS TO DIAGNOSE CHRONIC PANCREATITIS. *(Rus.)* Bojanovicz, K. (Gastroenterol. Hosp., Med. Acad., Lodz, Poland). *Klin. Med. (Mosk.)* 53(1):83-86, 1975.

6077 CERTAIN FEATURES OF ACUTE POSTOPERATIVE PANCREATITIS. *(Rus.)* Napalkov, P. N.; Kiselev, A. I. (Leningrad Sanit. Hyg. Med. Inst., USSR). *Sov. Med.* (3):53-57, 1975.

See also, 5339, 5340, 5625, 5628, 5639, 5646, 5647, 5648, 5657, 5664, 5665, 5673, 6035, 6042, 6377, 6391.

LIVER AND BILIARY TRACT

6078 LIVER FAILURE AND DRUG METABOLISM. *(E.)* Andreasen, P. B.; Ranek, L. (Rigshosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 10(3):293-297, 1975.

The drug-metabolizing capacity of the liver (as measured by the metabolic clearance of antipyrine in patients with hepatic encephalopathy) was investigated in order to determine whether these patients have lower antipyrine clearance than non-encephalopathic patients with liver disease. Of 13 patients with hepatic encephalopathy, eight had acute hepatitis and five, cirrhosis. All subsequently developed stage III encephalopathy, and only one survived. A second group of patients comprised five persons with cirrhosis. Data for these first two groups of patients were compared to those obtained from 21 subjects without liver disease and 19 patients with biopsy-proven cryptogenic and alcoholic cirrhosis, all without signs of encephalopathy. The hepatic microsomal metabolism of antipyrine was measured in the 18 patients with encephalopathy before, during, and after hepatic encephalopathy. The antipyrine clearance measured in 13 patients during hepatic encephalopathy (4.6 ml/min) was significantly lower than that of five patients investigated 4 weeks before or after hepatic encephalopathy (9.6 ml/min). It is concluded that the clearance of antipyrine as a measure of quantitative liver function is substantiated by these data, and its use as a prognostic indicator of acute liver failure is suggested.

6079 ON THE DIAGNOSTICAL VALUE OF THE INDOCYANINE CLEARANCE IN CHRONIC DISEASES OF THE LIVER. *(E.)* Janev, P.; Zarzova, E. (I.P. Pavlov Higher Med. Inst., Plovdiv, Bulgaria). *Folia Med. (Plovdiv)* 16(3):157-161, 1974.

The diagnostic value of the indocyanine green clearance test was studied in 42 patients with diseases of the liver. Of these, eight had clinically decompensated liver cirrhosis; 18 had diffuse hepatic involvement (including chronic hepatitis, chronic cholangiohepatitis, and hepatic steatosis); five had primary and/or metastatic carcinomas; one had hyperbilirubinemia; four had cholecystic disease and six had other disease with no hepatic involvement. Of all patients tested for indocyanine green clearance, 29 (69%) were positive, as compared to 12% for SGOT and 3.8% for SGPT, for example, among other liver function tests performed at the same time. There was a close correlation between the gravity of the liver disease and the deviation in indocyanine green clearance indices, especially in cases of liver cirrhosis. The half-elimination probe and the elimination constant were established as the most sensitive indices. Due to the high diagnostic value of this test, the simple techniques necessary for its performance, and the lack of side effects, it is concluded that the indocyanine green clearance test should be ranked as one of the more valuable methods in the estimation of impaired liver function.

6080 ALOPECIA, ASCITES, AND INCOMPLETE REGENERATION AFTER 85 TO 90 PER CENT LIVER RESECTION. *(E.)* Starzl, T. E.; Putnam, C. W.; Groth, C. G.; Corman, J. L.; Taubman, J. (Univ. Colorado Sch. Med., Denver). *Am. J. Surg.* 129(5): 587-590, 1975.

The clinical course of a 19 yr-old female with a well-differentiated hepatoma who underwent 85-90% hepatectomy was presented. Hepatic tissue remaining after surgery consisted of a lateral portion of the left lobe. The patient was supported postoperatively by i.v. therapy including continuous albumin infusion (serum albumin>3 g/100 ml). The patient, however, developed ascites and subtotal alopecia within a week. At no time had the patient received cytotoxic chemotherapy. Daily low-grade fevers persisted for 2 months. Hyperbilirubinemia and depressed prothrombin time returned to normal about 1 month after surgery. The ascites was treated successfully with diuretics and the patient's hair eventually regrew. Serial 99mTc liver/spleen scans showed substantial but incomplete liver regeneration, which reached a maximum 6 months after resection. After 20 months, liver function was normal and there was no evidence of recurrent tumor.

6081 HEMANGIOMAS OF THE LIVER IN INFANTS: REVIEW OF DIAGNOSIS, TREATMENT AND COURSE. *(E.)* Slovis, T. L.; Berdon, W. E.; Haller, J. O.; Casarella, W. J.; Baker, D. H. (Columbia-Presbyt. Med. Cent., New York, N.Y.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(4):791-801, 1975.

Clinical and roentgenologic findings were presented for six infants who presented with benign vascular liver tumors between the first day and third month of life. All had high cardiac output or frank congestive heart failure. Presenting signs also included abdominal mass or enlarging liver and cutaneous hemagiomas. I.v. urography, with total body opacification, showed abnormal liver findings in 3/6. 99mTc liver scans were abnormal in four patients. The most useful diagnostic test was arteriography, which showed hypervascular lesions and early venous runoff in all subjects. Four patients, who were managed non-surgically with digitalis, steroids and radiotherapy (150-600 rads) or combinations of these regimens were alive after 3 months to 2 yr. One patient died of congestive heart failure prior to initiation of therapy. The sixth patient underwent surgical excision and is alive 7 yr later. The successful medical management of these patients suggest that this mode of therapy should be used initially in infants who present with high output state or congestive heart failure and who have early draining hepatic veins on arteriography. Patients not in heart failure and without early draining hepatic veins should have a liver biopsy to rule out hepatoblastoma.

6082 THE POLYMERIZED ALBUMIN AND ANTI-ALBUMIN AUTOANTIBODIES IN PATIENTS WITH HEPATIC DISEASES. *(E.)* Lenkei, R.; Mota, G.; Dan, M. E.; Laky, M. ("Victor Babes" Inst., Bucharest, Romania). *Rev. Roum. Biochem.* 11(4):271-276, 1975.

Antibodies against polymerized albumin were detected in sera from four patients with liver disease and autoimmune disorders. Anti-polymerized albumin antibody was also detected in 65-95% of sera from 404 patients with various hepatic diseases including acute, chronic active and persistent hepatitis and cirrhosis. There was no correlation between the presence of hepatitis B antigen and anti-albumin antibody although 27-55% of albumin-antibody-positive patients were also hepatitis B antigen-positive. Anti-polymerized albumin was more commonly present, however, in patients with impaired liver function. It is suggested that anti-polymerized albumin antibody may be a useful test for liver function but may also contribute to false positive results when testing for hepatitis B antigen in certain patients.

6083 A COMPARISON OF SCANS AND ANGIOGRAMS IN SELECTING PATIENTS WITH HEPATOMAS FOR HEPATIC LOBECTOMY. *(E.)* Gammill, S. L.; Takahashi, M.; Jingu, K.; Stumpe, W.; Font, R. (Univ. Tennessee Med. Sch., Memphis). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(3):522-530, 1975.

The comparative abilities of ^{198}Au or ^{99m}Tc liver scan and selective hepatic angiography to predict operability were studied in 35 patients with hepatoma. Liver scan and angiography agreed regarding operability *versus* inoperability in 27 cases. In 23 cases, which were determined to be inoperable by both studies, inoperability was confirmed at laparotomy or autopsy. Three of the four patients in whom tumors were judged operable had tumor confined to one lobe at survey or autopsy; the fourth subject had microscopic metastases in an opposite lobe. Liver scan and angiography did not agree with respect to operability in eight patients, five of which were predicted correctly by angiography owing to its greater sensitivity in detecting neovascularization. These results indicate that combined liver scanning and selective hepatic angiography may be useful in predicting operability with respect to the primary lesion in patients with hepatoma.

6084 PATHOLOGICAL LIVER TESTS IN PATIENTS ON A LOW CARBOHYDRATE DIET. *(Ger.)* Lutz, W. (No affiliation). *Wien. Med. Wochenschr.* 125(18): 292-295, 1975.

SGOT, serum bilirubin and total plasma protein and protein fractions were determined in 190 patients with chronic liver disease who were placed on a low-carbohydrate diet (maximum of 12 g) with no restriction on protein and fat intake. No drugs were prescribed and no measures were recommended, e.g. abstention from alcohol, which might affect laboratory findings. Before institution of the diet, SGOT values fell into three groups: (1) from 13 to 20 mU in 126 cases, (2) from 21 to 40 mU in 50 cases, and (3) over 40 mU in 14 cases. SGOT values in group one normalized after patients had been placed on the diet for an average of 2 weeks, while those in groups two and three approached the normal range in most cases during the unspecified observation period. Leucine aminopeptidase values, determined in 23 patients, decreased over a 15 month period from a mean of more than 28 mU to a mean of 14 mU; normal values (below 20 mU) were attained after an average of ten months. Serum bilirubin values, which were initially elevated in 16 patients with no other signs of liver disease, decreased somewhat more slowly when carbohydrates were restricted. Using a method sensitive to 0.8 mg/100 ml bilirubin, the mean initial value of 1.6 mg/100 ml decreased almost to normal values (mean 1.0 mg/100 ml) over a 50-month period. The low-carbohydrate diet produced no appreciable changes in total plasma proteins or protein fractions. Since γ-globulin levels increased and ascites became more pronounced, the low-carbohydrate diet had to be abandoned in three cirrhotics.

6085 PALLIATIVE IRRADIATION FOR LIVER METASTASES. *(E.)* Turek-Maischneider, M.; Kazem, I. (Acad. Hosp., Cathol. Univ., Nijmegen, Netherlands). *JAMA* 232(6):625-628, 1975.

The palliative effect of liver irradiation in patients with symptomatic liver metastases is reported. All 11 patients (aged 11-56 yr) presented with upper abdominal pain, a palpable liver, and abnormal liver scans. The treatment was delivered by a telecobalt therapy unit, using two parallel opposing fields to cover the entire liver. Field size ranged from 15 x 20 to 20 x 24 cm, with leading-off of corners to match the field-to-liver shape and to minimize bowel irradiation. A daily dose of 150 rads calculated in the midliver plane was administered 5 times/week for 2-3 weeks. Response to treatment was evaluated according to the following categories: complete symptomatic relief, normalization or substantial improvement of liver function tests and liver scans (good); partial relief of symptoms, improvement of liver function tests, and reduction of the size of metastasis in the liver scans (moderate); and no symptomatic relief, no notable improvement of liver function tests, and no reduction in the size of metastasis in the liver scans (poor). Eight patients had good response; 2, moderate response; and 1 patient failed to respond to treatment. All patients tolerated the treatment and no deaths were attributed to liver irradiation. Three patients are alive at 4, 10, and 38 months, resp., after liver irradiation. It is concluded that radiation therapy is valuable for the treatment of symptomatic liver metastases, and is much safer than intrahepatic arterial infusion.

6086 THE HEPATORENAL SYNDROME: RECOVERY AFTER PORTACAVAL SHUNT. *(E.)* Ariyan, S.; Sweeney, T.; Kersten, M. D. (Yale Univ. Sch. Med., New Haven, Conn.). *Ann. Surg.* 181(6):847-849, 1975.

A case report is presented for a patient with the hepatorenal syndrome, a 78-yr-old man, admitted with cirrhosis of unknown etiology. On his first admission, he was noted to have tense ascites with 4+ pitting edema of the lower extremities. Hepatitis-associated antigen testing was negative; a liver scan showed a small liver with an enlarged spleen. He was placed on aldactone, digitoxin, a low salt and protein diet, and fluid restriction. Repeat liver biopsy showed fibrosis of the portal tracts. After several weeks, the ascites improved significantly, and he was discharged. One week prior to his second admission, he noticed increasing ascites and a 7-lb weight gain. Paracentesis revealed chylous ascites with 355 mg% lipids. Attempts at diuresis resulted in a rise in the blood urea nitrogen from 33 to 51. An enlarging umbilical hernia which was beginning to ulcerate was noted. Hepatic wedge pressure was 32 mm Hg; the i.v. cholangiogram was within normal limits and there was no hepatofugal flow. A successful side-to-side portacaval shunt was performed, and postoperatively, the hepatorenal syndrome was relieved. It is concluded that spontaneous recovery from the hepatorenal syndrome is rare; this patient is the 2nd case reported in the literature to recover from the hepatorenal syndrome following a surgical procedure to decompress the portal venous hypertension.

6087 ALPHA$_1$-ANTITRYPSIN DEFICIENCY AND HEPATIC CARCINOMA. *(E.)* Schleissner, L. A.; Cohen, A. H. (Harbor Gen. Hosp., Torrance, Calif.). *Am. Rev. Respir. Dis.* 111(6):863-868, 1975.

A patient with homozygous ZZ α_1-antitrypsin deficiency and severe emphysema, with a mixed carcinoma (hepatic and cholangiolar) of the liver in the absence of hepatic cirrhosis or fibrosis, was studied. When last admitted, the patient was in a respiratory coma. Serum alkaline phosphatase was 61.2 King-Armstrong U; neither serum α-fetoprotein nor hepatitis B antigen was detected, and there were no clinical signs of liver disease. On autopsy, the liver weighed 1,600 g and had a smooth capsular surface. The parenchyma was of usual consistency, displaying moderate passive congestion. Deep within the central portion of the right lobe was a firm, poorly delineated, whitish-tan mass measuring 6 cm in greatest diameter and surrounded by several smaller satellite lesions of similar description. Microscopic evaluation revealed hepatic parenchyma with normal ultrastructure. Intracellular inclusions in periportal hepatocytes were seen after periodic acid-Schiff stain. Malignant glandular structures were observed in the cholangiolar phase of the tumor. Because of the increasing frequency of hepatomas reported in patients with α_1-antitrypsin deficiency, it is suggested that a causal relation may exist.

6088 MANAGEMENT OF PRIMARY LIVER CELL CARCINOMA. *(E.)* Balasegaram, M. (Gen. Hosp., Kuala Lumpur, Malaysia). *Am. J. Surg.* 130(7):33-37, 1975.

An analysis of 352 cases of primary liver carcinoma is presented. The ratio of males to females was 4:1, and the patients ranged in age from 1 to 86 yr, with the majority aged 45-60 yr. Of the patients, 42 were admitted with acute abdomen after rupture of the hepatoma (15 of these died before any effective treatment could be carried out); 38 were admitted with bleeding esophageal or fundic varices associated with liver cirrhosis; and 52 had end-stage liver failure on admission. Of the total number of patients, 139 received no treatment: 34 left the hospital before treatment could be begun; 37 died of hemorrhage; and all 67 admitted with end-stage disease died within 2 weeks. Curative resection was attempted in 26 patients, and the results were: postoperative death (4); lost to follow-up (1); died within 1 yr (6); died within 2-3 yr (4); died within 3-4 yr (2); alive 2-3 yr later (4); and alive after 5 yr (5). Palliative treatment was attempted in the remaining 93 cases whose tumors were nonresectable. This included regional chemotherapy (25); complete hepatic dearterialization (60); and multiple dose therapy (60). Based on these data, it is suggested that attention be directed to detection of the definite causative factors of hepatic carcinoma, and perhaps more importantly, to the development of a good screening test to detect early carcinoma of the liver.

6089 ARTIFICIAL LIVER SUPPORT BASED ON HAEMOPERFUSION OF ADSORBENTS. *(E.)* Dunlop, E. H.; Weston, M. J.; Gazzard, B. G.; Langley, P. G.; Mellon, P. J.; Williams, R. (King's Coll. Hosp. Med. Sch., London, England). *Biomed. Eng. (NY)* 10(6):213-218, 1975.

The need for a device capable of performing the excretory functions of the liver during acute and chronic liver failure is discussed, and experience with an artificial liver support system is reviewed. Hemoperfusion through activated charcoal or Amberlite XAD-2 was tested in an animal model of acute liver failure. The model depends on surgically-induced ischemia, and, as such, the liver necrosis was irreversible. Of 35 patients treated by charcoal hemoperfusion, all of whom were in deep hepatic coma from fulminant liver failure, 16 recovered consciousness completely and 13 are now alive and well at home 18 months later. It is concluded that although the technology of adsorbent hemoperfusion is at the moment in its infancy, the subject provides unique opportunities for bioengineers and clinicians to develop new therapeutic measures for the treatment of liver failure and to improve existing methods for kidney failure and poisoning.

6090 HEMANGIOSARCOMA OF THE LIVER. SPECTRUM OF MORPHOLOGIC CHANGES AND CLINICAL FINDINGS.

(E.) Ludwig, J.; Hoffman, II, H. N. (Mayo Clin., Rochester, Minn.). *Mayo Clin. Proc.* 50(5):255-263, 1975.

Four cases of hemangiosarcoma of the liver and a brief review of the literature are presented, stressing features to enable the clinician and pathologist to make an earlier diagnosis. The patient group included 3 men and 1 woman, aged 36 (the woman) to 89 yr. The first case showed blood-filled cystic spaces in the liver lined by hemangiosarcoma cells. Vasoformative hemangiosarcoma tissue was seen to infiltrate the lumen of the hepatic vein. The final diagnosis was diffuse Kupffer cell carcinoma, of a nodular solid and microcystic type, with one small pulmonary metastasis, and ischemic hepatic necrosis; death was due to hepatic failure. The second case showed dilated hepatic sinuses lined by hyperchromatic hemangiosarcoma cells. The final diagnosis was a diffuse Kupffer cell sarcoma of the nodular and cystic type, without metastases, and possibly posthepatic cirrhosis. Death in this case was also due to hepatic failure. Hemangiosarcoma replacing the right lobe of the liver was seen in the 3rd case, with a small satellite nodule in the left lobe. The diagnosis was a circumscribed, nodular solid, and microcystic type of Kupffer cell sarcoma. Death was due to bronchopneumonia. Histologic examination of the liver in the 4th case showed multiple blood-filled cysts. An autoradiograph showed the typical α-ray tracks from thorium dioxide deposit (this patient had received 20 ml of thorotrast into the right carotid artery). Final diagnosis was a low-grade Kupffer cell sarcoma, of the diffuse cystic type, with thorium dioxide storage in the liver and lymphatic organs. Death came from exsanguination of the hepatic tumor. Analysis of these cases and a review of the literature indicated that these tumors are either predominantly cystic and fairly well-differentiated or are more solid and poorly differentiated. Well-differentiated tumors may resemble peliosis hepatitis or other benign conditions. It is concluded that the concept of Kupffer cell sarcoma is weakened by the fact that primary and secondary hemangiosarcomas in the liver, including their sinusoidal spread, are histologically indistinguishable.

6091 HEPATOCELLULAR CARCINOMA. A CLINICAL AND PATHOLOGICAL STUDY OF 33 CASES. *(E.)*

Tsakraklides, V.; Templeton, A. C.; Estensen, R.; Good, R. A. (Dep. Pathol., Univ. Minnesota, Minneapolis). *Minn. Med.* 58(6):450-453, 1975.

An analysis of 33 cases of hepatocellular carcinoma seen at postmortem at the University of Minnesota Hospitals is presented; the histological features, metastatic patterns, diagnostic problems, and relation to cirrhosis are discussed. Of 12,070 case records examined, 33 hepatocellular carcinomas were found, comprising 0.27% of the autopsies recorded in an 18-yr period. All were caucasian, and 73% were male, with the peak incidence in the 6th, 7th, and 8th decades. The representing signs and symptoms were abdominal pain and discomfort in 15 cases, hepatomegaly in 6, jaundice in 5, and nausea and vomiting in 4. Hematemesis was the presenting symptom in 3, fatigue and weight loss in 2, and fever of unknown etiology in 2. The diagnosis was prior to death in 16 cases, and only at autopsy in the remaining 17. The average duration from onset of symptoms to death was 5.5 months; the longest interval was 18 months. Death was caused by gastrointestinal bleeding in 10 cases, hepatic coma in 9, pneumonia in 7, hepatorenal failure in 5, and was operative or postoperative in 2. Cirrhosis was an associated disease in less than half of these patients. The incidence of hepatocellular carcinoma appeared in this geographical area to be rising slowly, and the incidence of cirrhosis as well as the incidence of liver carcinoma in cirrhotics did not significantly increase. The data suggest that the patients at particular risk were elderly males with coarse nodularity of the liver.

6092 ENZYME REPLACEMENT IN NIEMANN-PICK DISEASE BY LIVER HOMOTRANSPLANTATION. *(E.)*

Daloze, P.; Corman, J.; Bloch, P.; Delvin, E. E.; Glorieux, F. H. (Notre Dame Hosp., Univ. Montreal, Canada). *Transplant. Proc.* 7(1):607-610, 1975.

The feasibility of long-term enzyme replacement by liver homotransplantation as evaluated in a recipient afflicted in Niemann-Pick disease type A is reported. Hepatomegaly in an otherwise healthy 4-month old boy led to the early diagnosis of Niemann-Pick disease that was later confirmed by the demonstration of sphingomyelinase deficiency in WBC and cultured skin fibroblasts. Psychomotor retardation and massive hepatosplenic involvement were evident at age 1 yr. Orthotopic liver transplantation was performed at age 2 yr. Muscular activity increased, expression of the face became more mobile, and seizures that were frequent in the early postoperative period slowly became scarcer without specific medication. After transplantation, sphingomyelin did not reaccumulate in the grafted liver and could not be detected in urine. Indirect evidence appears to indicate that lipid deposits are beginning now to regress in some tissues, such as lungs and retina. Sphingomyelinase has been detected not only in the graft but also in several physiologic fluids including the cerebrospinal fluid. These observations raise the possibility for stabilization or even cure of some congenital enzymatic deficiencies by organ transplantation, when the deficient enzyme is not available by other means.

6093 REYE'S SYNDROME: EPIDEMIOLOGIC AND VIRAL STUDIES, 1963-1974.

(E.) Linneman, Jr., C. C.; Shea, L.; Partin, J. C.; Schubert, W. K.; Schiff, G. M. (Univ. Cincinnati Coll. Med., Ohio). *Am. J. Epidemiol.* 101(6):517-526, 1975.

The experience with Reye's syndrome in a single medical center from 1963-1974 is reported; only those cases shown to have fatty liver were included in the study. During this time period, 58 children with Reye's syndrome confirmed by liver biopsy were treated at this center. Cases were clustered in the winter and spring with the peak in February and March. These coincided with the occurrence of influenza and, numerically, were associated more closely with influenza B than with influenza A. Of the 58 cases, 6 were associated with chickenpox. From 1963-1971, before the beginning of a systematic epidemiologic and virologic study, 26 children with Reye's syndrome were seen. Viral infection was documented in either the patient or a contact in only 19% of those studied. Between 1971-1973, after the study was initiated, 16 cases of Reye's syndrome were diagnosed and viral infection was confirmed in 56% of these. In 1974, an epidemic of Reye's syndrome occurred during an influenza epidemic and viral infection was found in either the patient or a contact in 81% of 16 cases. During this study no significant environmental toxic exposures could be identified. Most children had taken aspirin and other medications, and 7 children had a history of excessive aspirin ingestion. This study demonstrates that an association with viral infection can be proven in the majority of cases of Reye's syndrome when an intensive investigation is undertaken.

6094 ALPHA-1-FETOPROTEIN AND THE HEAT STABLE ALKALINE PHOSPHATASE IN SOME LIVER DISEASES.

(E.) Zizkovsky, V.; Kordac, V.; Stepan, J.; El'gort, D. N. (Fac. Gen. Med., Charles Univ., Prague, Czechoslovakia). *Acta Hepatogastroenterol. (Stuttg.)* 22(2):92-97, 1975.

The presence of α_1-fetoprotein, heat-stable alkaline phosphatase, and Australia antigen (HB_sAg) was examined in 103 patients with porphyria cutanea tarda, 300 patients with cirrhosis, and 18 patients with primary liver carcinoma. Heat-stable alkaline phosphatase was detected in 46% of patients with porphyria cutanea tarda and in 61% of patients with primary liver carcinoma. α_1-Fetoprotein was detected in 61% of patients with primary liver carcinoma and in 2 patients with porphyria cutanea tarda in whom primary liver carcinoma was later proved. The simultaneous occurrence of α_1-fetoprotein and heat-stable alkaline phosphatase was found in 50% of cases with primary liver carcinoma. Neither the patients with porphyria cutanea tarda nor those with cirrhosis were HB_sAg-positive. HB_sAg could be detected in only 1 patient with α_1-fetoprotein-positive carcinoma of the liver. The finding of the heat-stable alkaline phosphatase in the blood sera of 46% of patients with porphyria cutanea tarda supports the hypothesis that this disease is a possible precancerous state. However, since the detection of the heat-stable alkaline phosphatase may be caused by the enzyme stabilized with one of the metabolites originating in porphyria cutanea tarda, the question requires further research.

6095 PATHOLOGY OF THE LIVER IN REYE'S SYNDROME.

(E.) Svoboda, D. J.; Reddy, J. K. (Univ. Kansas Med. Cent., Kansas City). *Lab. Invest.* 32(5):571-579, 1975.

Case reports are presented for 6 patients (4 men and 2 women, aged 4-16 yr) with Reye's syndrome, of whom 4 died. Needle liver biopsy specimens were obtained from all patients either shortly before death or during recovery from several hours of coma. Fixed and stained portions were examined under the light and electron microscopes. Light microscopy revealed that inflammation and necrosis of liver cells were especially prominent in fatal cases. Contrary to previous reports, electron microscopy indicated that aside from a loss of matrix dense granules, alterations in mitochondrial structure were minimal or absent. Although an increase in the number of liver cell microbodies has previously been reported, no such increase was apparent in the present study. The most unusual ultrastructural change in microbodies in the present study was the presence of noncrystalline cores in the matrix. No ultrastructural features distinguished patients who died from those who survived. Although derangement of mitochondrial function may be important, it is concluded that such derangement in the pathogenesis of Reye's syndrome is not necessarily reflected in mitochondrial ultrastructure.

6096 GLUCOSE INTOLERANCE AFTER MASSIVE LIVER RESECTION IN MAN AND OTHER MAMMALS.

(E.) Ida, T.; Ozawa, K.; Honjo, I. (Fac. Med., Kyoto Univ., Japan). *Am. J. Surg.* 129(5):523-527, 1975.

The relation between changes in glucose tolerance and in mitochondrial phosphorylative activity was studied after massive liver resection. In rabbits 24 hr after hepatectomy, when the phosphorylative activity in the mitochondria of the remnant liver was enhanced maximally, the blood glucose level did not increase significantly after glucose administration (2 g/kg). When the phosphorylative activity decreased to a submaximal level 48 hr after hepatectomy, the blood glucose level increased gradually but without a return to normal. About 6 weeks after partial hepatectomy, mitochondrial function gradually returned to normal levels and the glucose tolerance test results returned to within normal limits. The changes in the glucose tolerance tests in rabbits were also observed in Wistar rats and in a 27-yr-old man hepatectomized for blunt abdominal trauma. The return to normal of the glucose tolerance test results, however, was more rapid in rats: 3 hr after partial hepatectomy, the fasting blood glucose was at a hypoglycemic level; after 24 hr, the level increased to more than 150 mg/100 ml; and after 3 days, the glucose tolerance patterns returned to normal. The return of test results to normal in the patient was remarkably delayed: p.o. glucose

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tolerance testing, 50 g, was carried out at 14, 44, and 90 days, postoperatively; values did not return to normal until the second and third tests. Based on these data, it is suggested that the glucose tolerance test is very useful in evaluating the stage of regeneration in the liver remnant after massive liver resection.

6097 CORTISOL METABOLISM IN CHRONIC LIVER DISEASE. *(E.)* McCann, V. J.; Fulton, T. T. (R. Victoria Hosp., Belfast, Northern Ireland). *J. Clin. Endocrinol. Metab.* 40(6):1038-1044, 1975.

To further evaluate the effects of impaired degradation of cortisol, various parameters of cortisol metabolism were measured in 39 patients (22 men and 17 women, aged 13-74 yr) with chronic liver disease. These parameters included total and nonprotein-bound plasma cortisol measured as 11-hydroxycorticoids at intervals during the day, urinary excretion of cortisol, corticosteroid-binding globulin, and cortisol excretion rate. The group of patients included persons with active chronic hepatitis (9), persistent hepatitis (2), cryptogenic or postnecrotic cirrhosis (15), and alcoholic cirrhosis (13). The mean plasma total 11-hydroxycorticoids (11-OHCS) was lower in patients than in controls, although the difference was not statistically significant, and the normal circadian rhythm was maintained. However, in patients with chronic liver disease, a greater proportion of the 11-OHCS was in the nonprotein-bound state, resulting in an elevation of this fraction. Corticosteroid-binding globulin was lower in patients than in controls, although the difference was not statistically significant. Urinary cortisol excretion was significantly reduced, as was excretion of 17-ketosteroids. The cortisol secretion rate was normal. The elevation of nonprotein-bound 11-OHCS represents a resetting of the pituitary-adrenal feedback mechanism in these patients. It is suggested that elevation of plasma nonprotein-bound 11-OHCS, resulting from impaired metabolism and reduced protein binding of cortisol in patients with hepatic disease, may explain the features of endogenous hypercorticsm seen in such patients. Moreover, in the presence of impaired steroid metabolism and reduced protein binding, these patients may exhibit an increased sensitivity to corticosteroid therapy, and therefore administration of a reduced dosage may be advisable.

6098 LIVER PATHOLOGY IN ALPHA$_1$-ANTITRYPSIN DEFICIENCY: A REVIEW. *(E.)* Cohen, C. (South African Inst. Med. Res., Johannesburg). *S. Afr. Med. J.* 49(21):849-852, 1975.

The association of liver disease with alpha$_1$-antitrypsin (AAT) deficiency (AATD) is reviewed. The lowest serum levels of AAT, a low-molecular weight glycoprotein synthesized in the liver, are found in persons with the homozygous Z phenotype, normal individuals exhibiting the homozygous M phenotype. Twenty percent of Pi-type ZZ AATD infants present with a cholestatic type of neonatal hepatitis and develop a slowly progressive cirrhosis, and most die before reaching adulthood. Cirrhosis develops in about 10% of adult Pi ZZ homozygotes, coexistent emphysema occurring in most such individuals. In adults, primary hepatocellular and cholangiocellular carcinomas are frequently reported but are usually unsuspected during life. Specific globules resulting from the accumulation of a type of AAT are noted in the periportal liver cells of over 80% of homozygous and heterozygous Z AATD patients; liver disease is not always present. These globules are usually intracellular and increase in number and width with age. In infants, the percentage of liver cells containing globules is related to Pi-type and inversely related to the serum AAT concentration, but there is no relation to clinical state, liver cirrhosis, emphysema, or normal status. The defect in AATD resulting in the accumulation of these globules appears to reside in the liver. It is unlikely that they are directly hepatotoxic, although they may render the liver more susceptible to damage by other factors. An infectious factor has been suggested but none has been confirmed; an additional metabolic or nutritional factor has also been suggested. AATD infants have low birth weights, suggesting onset of liver disease in the fetus. The prognosis for patients with the neonatal hepatitis syndrome and Pi ZZ phenotype does not appear to be worse than for patients with the syndrome and normal serum AAT. Liver biopsies are of value in indicating or confirming AATD and in making an early diagnosis of hepatocellular carcinoma in AATD patients. Repeat liver biopsies are also of use in the follow-up of AATD patients.

6099 SURVIVAL OF PATIENTS WITH UNTREATED LIVER METASTASES FROM COLORECTAL CANCER. *(E.)* Baden, H.; Andersen, B. (Bispebjerg Hosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 16(1):221-223, 1975.

The effect of removal of the primary tumor on colorectal cancer patients with untreated liver metastases was studied. In October 1973, the survival status of 105 such patients, who had had the primary tumor removed between October 1962 and December 1972, was evaluated. The median survival time in this group was 10 months, nine patients being alive 108, 96, 93, 87, 56, 29, 18, 17, and 11 months after surgery. Among the nine patients still alive, the livers were definitely without metastases in two cases and their presence or absence was unconfirmed in the other seven. Of those who died, liver metastases were confirmed by autopsy in 77 cases and autopsies were not performed in the other 19 cases. These data, in conjunction with previous reports, indicate that the median survival time with untreated liver metastases is between 6 and 10 months after extirpation of the primary colorectal tumor; this value is considerably higher than would be expected in unselected series of liver metastases, suggesting that prognosis is better in patients who have had the primary tumor excised.

6100 ISOLATED LIVER NODULES. *(E.)* Shojania, N. G.; Hogg, G. R. (Univ. Manitoba, Med. Coll., Winnipeg, Canada). *Gastroenterology* 69(1):28-34, 1975.

A series of seven cases of isolated liver nodules is reviewed. Two were encountered at surgery and five at autopsy. Autopsy incidence was slightly less than one in 1000 over a 6 yr period. In no case were there symptoms or signs relating to the nodule. Most cases had single nodules, but three cases had three separate nodules each. All 13 nodules were spherical, measured 0.5 to 9.5 cm in diameter, were pale to yellow in color and were unencapsulated. Light microscopy showed histological features resembling regenerating nodules in cirrhotic liver in 11 nodules; two nodules were fatty in makeup. Except for the nodular areas, the livers were all grossly and histologically normal. The nodules showed a visible scarcity of red cells, suggesting that the nodules were relatively ischemic. This may have resulted from abnormal blood flow. The nodules typically contained prominent vessels not associated with the portal tracts or central veins. They had abnormal, unevenly thickened walls composed mainly of fibrous tissue with a few sparse muscle fibers. The fatty changes in two of the nodules also supported ischemia as the etiological factor. It is suggested that the amount of fatty change parallels the degree of ischemia, or that the fatty nodules are the earliest ischemic effect, which may later undergo focal septal fibrosis and regenerative activity.

6101 HUMORAL AUTOIMMUNE PHENOMENA IN LIVER DISEASE. *(Ger.)* Berg, P. A. (Med. Clin., Univ. Tubingen, Germany). *Z. Gastroenterol.* 13(suppl.):257-263, 1975.

Of 105 patients with acute viral hepatitis, 78 were positive for hepatitis B antigen (HBAg). Immunofluorescence studies showed that, at onset, 80% had anti-smooth muscle antibodies, 35% had antibodies to vascular endothelium, and 12% had antinuclear antibodies; none of these patients had antimitochondrial antibodies. Antibodies to vascular endothelium occurred only in patients with blood group O. They were of the IgG type and reacted with an antigen related to blood group substance A. These antibodies occurred either in association with HBAg or, in some cases, appeared only after the patients became HBAg-negative. In contrast to anti-smooth muscle antibodies, antibodies to vascular endothelium persisted for some time after acute symptoms had subsided; they were absent in patients with autoimmune diseases. Antinuclear antibodies were present in low titers and, in most cases, reacted only with heterologous tissue. Both antinuclear antibodies and anti-smooth muscle antibodies were present in only 10-20% of HBAg-positive patients with chronic aggressive hepatitis. Antibodies to vascular endothelium were found in 30-40% of patients with blood group O, but were present in 50% of those with cryptogenic cirrhosis. Patients with autoimmune phenomena were defined as HBAg-negative and HB antibody-negative who also had high titers of antinuclear antibodies in the presence or absence of anti-smooth muscle and antimitochondrial antibodies. The simultaneous presence of antinuclear and anti-smooth muscle antibodies in titers above 1:40 suggests lupoid hepatitis with or without cirrhosis. Antimitochondrial antibodies occur in more than 95% of all patients with primary biliary cirrhosis, and the association of these antibodies with antinuclear antibodies indicates the simultaneous existence of an inflammatory, autoimmune process in both the bile ducts and hepatic parenchyma. A very rare form of chronic aggressive hepatitis, which occurs in only one case in 800, is associated with antimicrosomal antibodies. In addition to chronic aggressive hepatitis resulting from viral infection, drug-induced forms are found in which high antibody titers are present, but antibodies disappear after discontinuation of use of the drug.

6102 METABOLISM OF LITHOCHOLATE IN HEALTHY MAN. I. BIOTRANSFORMATION AND BILIARY EXCRETION OF INTRAVENOUSLY ADMINISTERED LITHOCHOLATE, LITHOCHOLYLGLYCINE, AND THEIR SULFATES. *(E.)* Cowen, A. E.; Korman, M. G.; Hofmann, A. F.; Cass, O. W. (Mayo Clin., Rochester, Minn.) *Gastroenterology* 69(1):59-66, 1975.

The metabolism of i.v. administered radiolabeled lithocholate, its glycine conjugate (lithocholylglycine), its sulfate (sulfothiocholate), and its sulfated glycine conjugate (sulfolithocholylglycine) in healthy subjects is reported. Lithocholate radioactivity was excreted rapidly, predominantly in bile. The excreted radioactivity had the chromatographic properties of glycine and taurine conjugates of lithocholate, of which 60% were sulfated. Lithocholylglycine also was excreted rapidly, predominantly in bile, and 60% of the excreted radioactivity was sulfated. Sulfolithocholate radioactivity was only partially conjugated (about 60%) in association with biliary excretion. Sulfolithocholylglycine was excreted unchanged in bile. Neither sulfated derivative showed appreciable excretion in urine, although both were excreted more slowly in bile than unsulfated free or conjugated lithocholate. The data suggest that unconjugated lithocholate, which is absorbed, is completely conjugated and partially sulfated before excretion, which occurs exclusively in bile. Since sulfation is not complete, some unsulfated lithocholate is always present in bile. It is concluded that this conjugated but unsulfated lithocholate, if reabsorbed, would be again partially sulfated during its next enterohepatic circulation.

6103 PARTIAL DEFICIENCY OF HEPATIC GLUCOSE-6-PHOSPHATASE IN AN ADULT PATIENT. *(E.)* Stamm, W. E.; Webb, D. I. (Univ. Washington Affil. Hosp., Seattle). *Arch. Intern. Med.* 135(8):1107-1109, 1975.

A case of partial hepatic glucose-6-phosphatase deficiency in a 40-yr-old woman is described. The manifestations in childhood were mild and unrecognized, consisting only of frequent epistaxis and bruising. Beginning at age 14, the patient suffered episodes of acute arthritis involving a variety of joints; except for persistent malaise and fatigue, the patient was asymptomatic between attacks. Consanguinity was not present; she had six normal siblings and bore three healthy children of her own. She was of normal intelligence. Although blood glucose levels were low, actual hypoglycemia was not documented. The constellation of persistent acidosis, hyperlacticacidemia, hypercholesterolemia, hypertriglyceridemia, and hyperuricemia was repeatedly demonstrated over a period of several years. Unavailability of hepatic glucose-6-phosphate was demonstrated by a blunted hyperglycemic response to i.m. epinephrine and by a lack of blood sugar elevation following i.v. galactose. Other symptoms included bilateral arcus senilis and xanthelasma, s.c. tophi on the arms and legs, hepatic dullness, and decreased range of motion, synvovial thickening, s.c. nodules, and/or crepitus at the knees, elbows, ankles, wrists and small joints of the hands. A percutaneous liver biopsy demonstrated normal hepatocellular architecture with increased amounts of normally staining positive material. Partial glucose-6-phosphatase activity in this patient may explain her benign childhood course, emphasizing that patients with this deficiency may escape diagnosis during childhood, particularly if symptoms are mild or unrecognized. When acute gouty arthritis and tophaceous gout occur in an adolescent or young adult, the diagnosis of glucose-6-phosphatase deficiency should be considered.

6104 MORPHOLOGICAL CHANGES IN THE LIVER IN METABOLIC DISORDERS. *(Ger.)* Wohlgemuth, B. (Dep. Med., Karl Marx Univ., Leipzig, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(1):17-22, 1974.

Metabolic diseases affecting the liver result in deposition of material foreign to liver cells or in deposition of nonphysiological quantities of substances normally found there. Mild forms of toxic parenchymal damage are characterized by localized cellular necrosis, steatosis and jaundice in addition to changes in metabolic activation (anisocytosis and anisokaryosis, increase in the size of nucleoli, increase in the number of bi- and multinuclear hepatocytes, and changes in parenchymal structure). Kupffer cells are activated but show no signs of proliferation. In more severe damage the centrilobular areas are affected and necrosis of groups of cells, more marked steatosis, and leukocyte infiltration are observed. Cholestasis is occasionally present and is generally manifested by bile thrombi. The most severe form of parenchymal damage is dystrophy in which the entire liver becomes necrotic and there is no evidence of inflammation. The most common types of endogenous and exogenous metabolic diseases affecting the liver are briefly outlined.

6105 BILE ACIDS IN THE BLOOD AND URINE OF JAUNDICED AND NONJAUNDICED PATIENTS WITH VARIOUS LIVER DISEASES. *(Ger.)* Wildgrube, H. J.; Dittmann, K.; Erb, W. (Cent. Intern. Med., Univ. Frankfurt/Main, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:448-450, 1974.

Sulfate esters of bile acids were extracted from blood and urine specimens taken from 50 patients with compensated cirrhosis and 20 with hepatic metastases. The extracts were then fractionated on Sephadex LH 20, and sulfated bile acids were separated by gas-liquid chromatography of their trifluoro acetylated methyl esters on 3% QF-1. Patients with compensated cirrhosis had no evidence of jaundice (serum bilirubin levels lower than 1.5 mg/100 ml) or ascites, and none of the patients with hepatic metastases had primary tumors in the liver or biliary tract. The concentration of sulfate esters of blood bile acids in compensated cirrhosis ranged from 2 to 110 μM/l (mean 25.4 μM/l), while free and conjugated bile acid concentrations ranged form 7 to 130 μM/l (mean 31.8 μM/l). No significant correlation was found between these forms of bile acids. Most of the bile acids excreted in the urine of cirrhotics were in the form of sulfate esters. The rate of excretion averaged 0.84 μM/24 hr (maximum 2 μM/24 hr), and the content of free and conjugated bile acids was usually lower (around 0.68 μM/24 hr). These findings contrast with those observed previously in cirrhotics with epithelial or portal decompensation in whom both bile acid fractions were significantly increased. In both blood and urine, the concentration of cholic acid was significantly decreased. Patients with hepatic metastases had jaundice and increased concentrations of bile acids in their blood. However, the relative percentage and absolute concentrations of sulfated bile acids were completely independent of serum bilirubin concentrations. Many patients with high serum bilirubin concentrations (above 12 mg/100 ml) had relatively low sulfated bile acid concentrations, and these concentrations varied greatly during the day. These findings indicate that formation of sulfate esters of bile acids is not a protective mechanism occurring only in cholestasis.

6106 GRANULOMAS OF THE LIVER. *(E.)* Neville, E.; Piyasena, K. H. B.; James, D. G. (R. North. Hosp., London, England). *Postgrad. Med. J.* 51(596):361-365, 1975.

Clinical, radiological, and immunological data were reviewed in 138 cases of biliary hepatic granuloma, for factors helpful in defining etiology and prognosis, and for determining whether granulomatous hepatitis is a distinguishable condition. Of the patients, 75 had sarcoidosis, 26 had primary biliary cirrhosis, 23 had miscellaneous known disorders and 14 had idiopathic disease. Of the sarcoidosis group, 68% presented at 20-40 yr of age with no sex predilection, while 81% of the cirrhosis group presented at 30-50 yr and all but one were female. The miscellaneous group was predominately female, while the idiopathic group was mostly males over 50 yr of age. The sarcoidosis and cirrhosis groups presented with typical symptoms of the respective conditions. Liver function tests were most commonly abnormal in the cirrhosis and miscellaneous groups. Aspartate transaminase activity was most frequently abnormal (elevated in 85% overall), followed by alkaline phosphatase activity (62%). An abnormal chest radiograph was found in 55% of all patients, 84% of these in the sarcoidosis group. The Kveim-Siltzbach skin test was positive in 72% of the sarcoidosis group, but in no other group. Autoantibodies were most common in the cirrhosis group (79%). In 46 of the sarcoidosis group followed up for 1 to 14 yr, 76% showed complete resolution, and 17% had chronic, persistent sarcoidosis. Of the cirrhosis group after a 1 to 10 yr follow-up, 30% died, 12% developed portal hypertension, and all had progressively abnormal liver function tests. Of the 14 idiopathic patients, five recovered spontaneously in 2 to 4 yr, and one recovered with anti-tuberculous chemotherapy. It is concluded that clinical picture, X-ray, blood, skin and microbiological tests result in diagnosis of cause in 90% of the cases; the term granulomatous hepatitis should be reserved for the undiagnosed 10% until follow-up reveals a more definitive cause.

6107 BENIGN HEPATOCELLULAR TUMOURS. *(E.)* Sorensen, T. I. A.; Baden, H. (Gentofte Hosp., Univ. Copenhagen, Denmark). *Scand. J. Gastroenterol.* 16(1):113-119, 1975.

The clinical, histological, and therapeutic experience in 250 cases of benign hepatocellular tumors is reviewed and an approach to the management of such tumors is suggested. Of all benign tumors and tumor-like lesions containing liver cells, only focal nodular hyperplasia (FNH), liver cell adenoma (LCA), and nodular liver cell adenoma are considered benign hepatocellular tumors. Of the 250 cases collected from Anglo-Saxon, German, French, and Scandinavian literature between 1923 and 1974, there were 141 cases of FNH, 69 cases of LCA (including 11 cases of nodular liver cell adenoma), and 40 unclassified tumors (UT). The frequency of these tumors may be increasing. In the clinical series, the female:male ratio was 3.7, with the incidence being highest among females in the fertile years and males between 0 and 30 yr; in the necropsy series, the female:male ratio was 1.6 and the median age was 50 yr. Most FNH were 4-7 cm, firm, and found in the left lobe, while most LCA were 8-15 cm, soft, and found in the right lobe. By light and electron microscopy, the cells and microstructures of the tumors resemble normal hepatic tissue. FNH is not potentially malignant, although LCA may be. Thirty-five percent of the FNH patients and 44% of the LCA patients presented with symptoms of moderate pain in the upper right abdominal quadrant, abdominal mass, and/or gastrointestinal upset. Complications, generally acute abdominal disease caused by hemorrhage and necrosis of the tumor, were the first manifestations in 38% of the LCA and none of the FNH patients. A hepatic tumor was preoperatively diagnosed by radiography, arteriography, and/or scintigraphy in 20% of the patients, and a preliminary diagnosis by biopsy was reported in 40 cases, with frozen section in 24, and with paraffin section in 16. Local resection or hemihepatectomy was used to remove the tumor entirely in 148 patients and partially in 34 patients. Total removal of the tumor generally cured the patient, and the outcome was good in 50% or more of the patients after partial removal. In patients with FNH, removal is not indicated if a major hepatic resection is required but is both effective and justified in the presence of complications or symptoms requiring treatment. In cases of LCA, the tumor should be removed. Enucleation of benign hepatocellular tumors is not advised and hormonal contraception should be discouraged in female patients. A 5-yr follow-up with ultrasonic scanning or scintigraphy is recommended.

6108 HEPATOSIS OF PREGNANCY. A CLINICAL STUDY OF 107 PATIENTS. *(E.)* Ylostalo, P.; Ylikorkala, O. (Dep. Obstet. Gynaecol., Univ. Oulu, Finland). *Ann. Chir. Gynaecol. Fenn.* 64(2):128-134, 1975.

The clinical experience in 107 patients with hepatosis of pregnancy is reported and compared with that in 61 controls with normal pregnancies. All cases were evaluated with regard to the date and duration of delivery, birth weight and condition of the neonate, and weight of the placenta. The hepatosis group was also given liver function tests and a glucose tolerance test, and the urinary estrogen levels were measured daily. The duration of the first stage of delivery was slightly ($p < 0.05$) shortened in the hepatosis group, and delivery took place more than 2 weeks earlier in this group than in the controls. There were two fetal deaths in the hepatosis series. The average Apgar scores at 1 and 15 min were slightly but significantly lower in the hepatosis group than in the controls, with no differences in scores according to sex. In addition, the average birth weight was slightly lower in the hepatosis group, and 11.9% of the infants in this group weighed less than 2.5 kg at birth. The absolute and relative placental weights did not differ between the two groups, although there were histologically evident maturing defects in the placenta in 20 of the 58 hepatosis cases studied. The liver function tests confirmed the cholestatic nature of the disease, yielding elevated aminotransferase, alkaline phosphatase, and bilirubin levels. The thymol turbidity test was within normal limits, indicating that the hepatosis series may have included cases of hepatitis. Neither glucose nor daily urinary estrogen levels differed significantly from normal. Fifty-five percent of the multiparous hepatosis patients had suffered from this disorder during earlier pregnancies. The fetal survival rate in hepatosis of pregnancy can be considerably improved by intensive hospital treatment during pregnancy.

6109 ON THE EXISTENCE OF INTRAHEPATIC BILE DUCT SHUNTS. *(E.)* Aiginger, P.; Polterauer, P.; Tizian, C. H. (Univ. Vienna, Med. Sch., Austria). *Anat. Embryol.* 147(1):111-116, 1975.

A combined scintigraphic-radiological method was used to study the existence of intrahepatic shunts between the bile ducts of the right and left duct systems in 28 human autopsy specimens. The average age at death was 39 yr and there were equal numbers of males and females. The proximal section of the common bile duct was exposed, and meglumine diatrizoate and Tc-99m Pertecnetat were injected in different orders into the left or right intrahepatic bile duct system after application of a water-tight ligature immediately proximal to the hepatic bifurcation. In all cases, passage of the injected substances into the periphery was observed. Although very small biliary capillaries were visualized, the substances did not appear to enter the contralateral bile duct system. Similarly, intralobular shunts were not observed following bilateral drainage of the caudate lobe. Despite the great difference in viscosity in the substances used, identical results were obtained with the combined radiologic-scintigraphic method. On the basis of these results, no conclusions regarding function can be made.

6110 REYE SYNDROME: A CORRELATED ELECTRON-MICROSCOPIC, VIRAL, AND BIOCHEMICAL OBSERVATION. *(E.)* Tang, T. T.; Siegesmund, K. A.; Sedmak, G. V.; Casper, J. T.; Varma, R. R.; McCreadie, S. R. (Milwaukee Child. Hosp., Wis.). *JAMA* 232(13): 1339-1346, 1975.

Liver biopsy specimens from two patients with Reye syndrome were examined ultrastructurally and for viral particles and urea-cycle enzyme activity. The patients, 10- and 14-yr-old boys, were hospitalized with symptoms of upper respiratory tract infection, persistent vomiting, delerium, combative behavior, and hyperammonemia. The first patient died 15 hr after admission and autopsy speciments of lung, liver, and heart were obtained. The second patient recovered and was discharged after nine days; a liver biopsy specimen was obtained on the second day after hospitalization. In addition, urine, serum, and throat swab samples were obtained from both patients. The liver specimens were examined by electron microscope and attempts were made to isolate viral particles from the other tissues and urine and throat specimens after inoculation into cultures of human foreskin fibroblasts, WI-38, HeLa, HEp-2, and grivet monkey kidney cells. The serum samples were tested for antibodies to various viruses by microcomplement fixation and hemagglutination inhibition procedures and were assayed for hepatic ornithine transcarbamoylase, hepatic carbamoyl phosphate synthetase, arginase, and glycogen. The hepatocytes from both patients contained a large amount of glycogen and degenerating mitochondria. Numerous herpes-like virus and myxovirus/paramyxovirus particles were seen in the spaces of Disse and sinusoids, and there was a leakage of glycogen granules into these areas. Cytomegalovirus was isolated from the heart and liver speciments of the first patient, but no particles were isolated from the liver specimen of the second patient or urine specimens of either patient. The results were supported by the serologic tests, and serum hepatic ornithine transcarbamyolase levels in both patients were subnormal. The pathogenesis in Reye syndrome therefore appears to involve an initial synergistic insult to the liver by mixed types of viruses and subsequent breakdown of the urea cycle, Krebs cycle, and possibly other hepatic functions.

6111 FATTY METAMORPHOSIS IN PATIENTS WITH JEJUNOILEAL BYPASS. *(E.)* Salmon, P. A.; Reedyk, L. (Dep. Surg., Univ. Alberta, Edmonton, Canada). *Surg. Gynecol. Obstet.* 141(1):75-84, 1975.

The natural course of fatty metamorphosis of the liver was studied in 106 patients who underwent end-on-jejunoileal bypass between 1967 and 1970. Wedge or percutaneous needle liver biopsies were performed on all patients at the time of surgery and at various intervals thereafter. The biopsy material was examined for evidence of fatty metamorphosis and cirrhosis, and liver function tests were performed within a few hr of each biopsy. Two-thirds of all preoperative patients had some degree of fatty metamorphosis of the liver and at least 8-10% had marked steatosis prior to the bypass procedure. Marked fatty metamorphosis was most common in the massively obese patients, while the incidence of moderate to minimal fatty infiltration was highest in the less obese patients; there was, however, no strict correlation between degree of fatty infiltration and obesity. After surgery, 95% of the patients showed moderate to severe fatty metamorphosis within the first 300 days. Subsequently, the incidence of fatty infiltration rapidly decreased, so that by 1500-2000 days postsurgery, the incidence of severe steatosis had returned to preoperative levels; only those patients with marked postoperative involvement and complications late in the postoperative course had a severe degree of fatty metamorphosis after 1000 days. The liver function tests were of no value in detecting quiescent cirrhosis or minimal to moderate degrees of fatty metamorphosis, and showed only inconsistent changes in those patients with severe steatosis. Cirrhosis occurred in one patient after the liver was completely cleared of fat and was present to a degree in another patient at the time of bypass. Mononuclear cell infiltration of the portal tracts was found in about 50% of the preoperative biopsies, but did not correlate well with the incidence of hepatic steatosis. Because severe postoperative fatty infiltration in patients with preoperatively normal or minimally infiltrated livers occurred during the period of rapid weight loss, it is suggested that the extensive mobilization of depot stores of fat to fulfill the caloric requirements of the patient results in the accumulation of triglyceride in the liver. Steatosis may be further aggravated by the reduction in protein absorption and concomitant reduction in the formation of low-density lipoproteins in the liver.

6112 LIVER FAILURE IN THE POSTOPERATIVE PATIENT: THE ROLE OF SEPSIS AND IMMUNOLOGIC DEFICIENCY. *(E.)* Norton, L.; Moore, G.; Eiseman, B. (Univ. Colorado Med. Cent., Denver). *Surgery* 78(1): 6-13, 1975.

The cellular immune response was studied in 20 of 73 patients who developed liver failure and coma preoperatively. Quantitation of the cellular immune response in these patients, most of whom were alcoholic, included a differential leukocyte count, reduction of nitroblue tetrazolium by the blood neutrophils, the lymphocyte phytohemagglutinin (PHA) response, the ratio of T:B lymphocytes, serum immunoglobulin (Ig) A, G, and M levels, serum zinc concentration, lymphocyte sensitization to a skin test antigen, and skin reactions to intradermal tuberculin, mumps, and *Candida albicans* antigen. Among the 73 original patients, bacterial sepsis, generally of i.p. origin, was a major contributing factor in precipitating hepatic failure in 27; the mortality rate in this group was 48%. Massive blood loss and prolonged hypotension precipitated coma in 14 patients, of whom 10 died, bleeding from esophageal varices precipitated liver failure in 25 patients, 23 of whom died. Four patients had serum hepatitis and two died, and liver failure was attributed to the toxic effects of anesthesia in three patients, two of whom died. The cellular immune response in the 20 cirrhotic patients showed a reduced leukocyte count, a significant reduction in the lymphocyte PHA response, T lymphocyte count, and serum zinc concentration, and significant increases in serum IgA, IgG, and IgM. The percentage of cirrhotic patients reacting positively to intradermal tuberculin, mumps, and *Candida albicans* antigen was also increased over control levels. The results suggest the presence of a depressed cellular immune response in cirrhotic patients; thus, once such patients become septic, they are at double risk since they cannot mount a proper immunologic response. An aggressive attitude toward the elimination of infection is justified, therefore, as is re-exploration in any postoperative or postinjury patient who has any possibility of having undrained i.p. sepsis.

6113 SIGNIFICANCE OF ELEVATED LIVER ALKALINE PHOSPHATASE IN SERUM. *(E.)* Brensilver, H. L.; Kaplan, M. M. (New England Med. Cent. Hosp., Boston, Mass.). *Gastroenterology* 68(6):1556-1562, 1975.

To verify the hepatic origin of the band L isoenzyme, polyacrylamide gel electrophoresis was used to fractionate the serum alkaline phosphatase in 317 patients in whom the cause of the alkaline phosphatase elevation was not apparent or in whom the elevation appeared out of proportion to the extent of the disease present. In 87 patients with increased L band activity who did not have clinically apparent liver disease, liver biopsies and liver function tests were also performed. Of the original 317 sera, the alkaline phosphatase elevation was due to band L in 253. These 253 patients included 166 with hepatic disorders generally associated with such an elevation; the mean alkaline phosphatase in this group was 19.6 Bodansky U, compared with 8.8 in the 87 patients with increased L band activity in whom there was no apparent liver disease. In 19 of the latter 87 cases, liver disease was further excluded by liver biopsy, liver function tests, and/or laparotomy. The 87 cases also included 19 with acute coronary vascular disease or congestive heart failure in whom unrecognized passive congestion of the liver may have contributed to the alkaline phosphatase elevation. None of the other patients, including 24 with Hodgkin's disease and nine with tumors, had recognizable liver disease. In light of these findings, studies were undertaken to confirm the hepatic origin of band L. Band L and alkaline phosphatase extracted from human liver migrated together on polyacrylamide gels before and after digestion with *Vibrio cholerae* neuraminidase and they had identical pH optima, sedimentation coefficients, Michaelis constants, and rates of inactivation at 55.5 C. However, they had different rates of inactivation in 3 M urea. Overall, the data indicate that band L is of liver origin and that elevation of the hepatic alkaline phosphatase isoenzyme may be a nonspecific finding in certain patients.

6114 THE RELATIONSHIP OF RED CELL MEMBRANE LIPID CONTENT TO RED CELL MORPHOLOGY AND SURVIVAL IN PATIENTS WITH LIVER DISEASE. *(E.)* Powell, L. W.; Halliday, J. W.; Knowles, B. R. (R. Brisbane Hosp., Queensland, Australia). *Aust. N. Z. J. Med.* 5(2): 101-107, 1975.

The relation between RBC membrane lipid content and RBC morphology and survival was studied in 15 patients with hepatic cirrhosis and seven patients with cholestatic jaundice. RBC morphology was also studied in 56 additional patients with hepatic cirrhosis to determine the prevalence of deformed RBC in this disease. Serum lecithin:cholesterol acyltransferase (LCAT) activity and RBC lipids were determined in the original 22 cirrhotic and jaundiced patients and in seven healthy volunteers. RBC morphology was studied in all liver disease patients using air dried smears, wet preparations, and scanning electron microscopy of the peripheral blood. RBC survival was measured by the radioactive chromium technique. Both RBC cholesterol and RBC phospholipid were significantly elevated over control values in the patients with liver disease, the type of disease having no significant correlation with the degree of elevation. In two patients with significant numbers of "spur" poikilocytes in the peripheral blood, RBC cholesterol was significantly increased but RBC phospholipid content was normal. The serum cholesterol levels did not correlate significantly with the RBC lipid levels. Serum LCAT activity was reduced in liver disease, the level of enzyme activity correlating significantly with the serum total bilirubin; it did not correlate significantly with RBC cholesterol or phospholipid values or serum cholesterol content. Peripheral blood smears from the liver disease patients regularly showed macrocytes, target cells, and some poikilocytes, but the number of deformed RBC did not correlate with RBC lipid content or RBC survival. Of the additional 56 hepatic cirrhosis patients in whom morphology was studied, distorted RBC were found in only two. RBC survival was reduced in most patients, but the degree of hemolysis did not correlate significantly with RBC lipid, the presence or degree of splenomegaly, or serum iron, folate, or vitamin B_{12} concentrations. Marked hemolysis was, however, correlated with a large number of spur poikilocytes. The results indicate that only in patients with spur-cell anemia do the morphologic alterations lead to the premature removal of cells from the circulation.

6115 HEPATOCELLULAR CARCINOMA AND A VARIANT ALKALINE PHOSPHATASE. *(E.)* Higashino, K.; Ohtani, R.; Kudo, S.; Hashinotsume, M.; Hada, T.; Kang, K. Y.; Ohkochi, T.; Takahashi, Y.; Yamamura, Y. (Osaka Univ. Sch. Med., Japan). *Ann. Intern. Med.* 83(1):74-78, 1975.

The clinical, laboratory, and pathologic findings in patients with a variant alkaline phosphatase are reported, and the usefulness of this enzyme in the diagnosis of hepatocellular carcinoma is discussed. Serum samples were obtained from 100 control subjects, 13 patients with primary hepatoma, and 117 patients with other liver and extrahepatic diseases; liver and tumor tissues were obtained at autopsy from 13 patients with hepatoma and 94 patients with other diseases. Alkaline phosphatase was extracted from these tissues, fractionated, and subjected to polyacrylamide gel electrophoresis. Screening for serum alpha-fetoprotein was done by a micro double diffusion method. Four of the 13 primary hepatoma patients had the variant serum alkaline phosphatase, which resembles the placental D-variant but differs from it in electrophoretic mobility, pH optimum, heat stability, and inhibition by phosphate. The appearance of the variant enzyme was independent of serum alkaline phosphatase activity and was not found in the sera of patients with diseases other than hepatocellular carcinoma. Alpha-fetoprotein was found in the sera of 10 of the 13 primary hepatoma patients, the occurrence of the deviant serum enzyme being independent of the alpha-fetoprotein concentration and the appearance of the Regan or Nagao isoenzymes. The tumor tissues of three patients with the variant serum enzyme were examined and all were found to contain the enzyme in question. Since all of the patients in whom the variant alkaline phosphatase was present had a massive type of hepatocellular carcinoma with grade III differentiation by Edmondson's classification, the detection of this enzyme in the serum may be of value in confirming a diagnosis of hepatoma.

6116 LIVER MORPHOLOGY AND LIVER FUNCTION BEFORE AND AFTER INTESTINAL SHUNT OPERATION FOR OBESITY.

(E.) Dano, P.; Nielsen, O. V.; Petri, M.; Jorgensen, B. (Rigshosp., Copenhagen, Denmark). *Scand. J. Gastroenterol.* 10(4):409-416, 1975.

The influence of obesity and intestinal shunt operation on liver function and morphology was studied in 49 patients. Liver biopsy and liver function tests were performed in 17 patients before and 14 months after the bypass operation. In another 20 patients, liver biopsy was performed postoperatively only, and in 13 patients preoperatively only. Three types of operations were performed: in type I, 36 cm of proximal jejunum was anastomosed end-to-side to 12 cm of terminal ileum; in type II, 24 cm of proximal jejunum was anastomosed to 24 cm of terminal ileum; and in type III, 12 cm of proximal jejunum was anastomosed to 36 cm of terminal ileum. Weight loss after the operation was most pronounced during the first 6 months and the degree of loss did not vary significantly according to the type of operation. In 29 patients with liver biopsy before surgery, steatosis was present in 25. In the 17 patients examined 14 months after surgery, the degree of hepatic steatosis was increased in seven, decreased in eight, and unchanged in two. In eight patients, a further biopsy 15 months later showed decreased steatosis in five and no alteration in three. There was no correlation between the rate of weight loss in the first 12 months and the change in hepatic steatosis. In the 20 patients examined postoperatively only, all had hepatic steatosis; in 10 patients examined several months later, hepatic steatosis was decreased in five and unchanged in five. No patient developed cirrhosis during the time of observation, although one patient each in the preoperative and postoperative only groups had cirrhosis. Within the first postoperative yr, there was a significant increase in the serum alanine-aminotransferase levels and a minor increase in alkaline phosphatases and BSP; these changes did not correlate with the rate of weight loss or degree of steatosis. The incidence of gallbladder disease was 15% preoperatively and two additional patients were cholecystectomized postoperatively. The results indicate that both serial biopsies and quantitative measurements of hepatic lipid are necessary when further information on the influence of the bypass operation on the liver is desired. The intestinal shunt operation is still recommended in selected cases of obesity.

6117 α-FETOPROTEIN IN NONNEOPLASTIC HEPATIC DISORDERS.

(E.) Bloomer, J. R.; Waldmann, T. A.; McIntire, K. R.; Klatskin, G. (Yale Univ. Sch. Med., New Haven, Conn.) *JAMA* 233(1):38-41, 1975.

To define the specificity of the radioimmunoassay for serum α-fetoprotein as a diagnostic test for hepatoma, serum α-fetoprotein levels were measured by radioimmunoassay in 473 patients with biopsy-proven nonneoplastic disorders. The patients ranged in age from 3 yr to 80 yr; their diseases included viral hepatitis, inactive postnecrotic cirrhosis, chronic active hepatitis, drug-induced hepatitis, primary biliary cirrhosis, alcoholic liver disease, extrahepatic biliary disease, obstructive jaundice, and other miscellaneous hepatic disorders. α-Fetoprotein levels were also measured in 75 patients with proved hepatocellular carcinoma, 350 patients with nonhepatic nonneoplastic disease, and 130 healthy volunteers. Among the patients with nonneoplastic hepatic disorders, 22% had α-fetoprotein values greater than 40 ng/ml, levels exceeding 40 ng/ml being found in 30% of the patients with various types of hepatitis, and in 0-15% of those with other diseases. None of the healthy controls and only one of the patients with nonhepatic benign diseases had an α-fetoprotein value over 40 ng/ml. Among the 75 hepatoma patients, serum α-fetoprotein levels exceeded 40 ng/ml in 69% and exceeded 3000 ng/ml in 48%. The results indicate that radioimmunoassay may, because of its sensitivity, become the method of choice for measuring α-fetoprotein levels in patients with primary hepatoma, although some specificity for the diagnosis of hepatoma will be lost. The occurrence of elevated serum α-fetoprotein levels in several other nonneoplastic hepatic disorders may reflect hepatic regeneration.

6118 DIAGNOSTIC VALUE OF SERUM BILE ACIDS.

(Ger.) Schwarz, H. P.; Paumgartner, G.; Preisig, R. (Inst. Clin. Pharmacol., Univ. Bern, Switzerland). *Schweiz. Med. Wochenschr.* 105(17):533-535, 1975.

Fasting serum bile acids, serum bilirubin, SGOT, alkaline phosphatase, the galactose excretion test, and BSP retention and clearance tests were performed on 60 normal controls, 14 patients with Gilbert's syndrome, four with Dubin-Johnson syndrome, and 48 with a variety of liver diseases. Bile acids were extracted with Amberlite XAD-2, incubated with 3α-hydroxysteroid dehydrogenase, and measured fluorimetrically. In controls, serum bile acid levels ranged from 1.6 to 9.2 μM/liter (means 6.1 ± 1.7 μM/liter for males and 5.9 ± 1.7 μM/liter for females). All 14 patients with Gilbert's syndrome and two of the four with Dubin-Johnson syndrome had values within the normal range; the two other patients with Dubin-Johnson had slightly elevated levels (10.5 and 10.6 μM/liter, resp.). With the exception of two patients with fatty liver and one with cryptogenic cirrhosis, patients with all other liver diseases (94%) had increased serum bile acid levels. However, a differential diagnosis could not be established on the extent of this increase. BSP retention gave abnormal results in 96%, BSP clearance in 90%, SGOT in 88%, galactose excretion in 65%, alkaline phosphatase in 60%, and serum bilirubin in 40%. Significant correlations were found between serum bile acid levels and BSP retention, the BSP clearance constant k_1, and serum total bilirubin values. However, large discrepancies were noted in some cases: 27 of the 45 patients with increased bile acid values had normal serum bilirubin levels. When serum bile acid determinations were repeated 2 hr after a standard breakfast (egg, bread and butter, coffee), significant postprandial increases occurred in all eight patients with cirrhosis and all 10 controls tested. However, bile acid concentrations of more than 10 μM/liter were never observed in controls. This relatively simple method for determining serum bile acids appears to be a very sensitive method for diagnosing liver disease. In patients with normal or borderline values, determinations should be repeated 2 hr after a standard breakfast. Since serum bile acid values in three patients with cirrhosis increased significantly after portacaval shunt surgery and excretory liver function, measured with the BSP transport maximum, remained the same, the increased bile acid concentrations found in patients with liver disease appear to be due both to impaired liver cell function and porto-systemic shunts.

6119 CRITERIA FOR THE ACTIVITY OF PATHOLOGICAL CONNECTIVE TISSUE PROLIFERATION IN CHRONIC LIVER DISEASE. *(Ger.)* Grasedyck, K.; Helle, M.; Lindner, J.; Langness, V. (1st Med. Clin., Univ. Hamburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80: 503-506, 1974.

Total collagen contents, expressed as hydroxyproline, and collagen synthesis, using prolyl hydroxylase activity as the criterion, were measured in the livers of 10 cadavers. Collagen was also separated into four fractions on the basis of solubility in neutral salt and acid solutions. The collagen content increased proportionally with the extent of fibrosis or cirrhosis, but no relation was observed between the extent of fibrosis and the distribution pattern for individual collagen fractions. However, total collagen values obtained on fat-free dry tissue agreed well with values for the collagen fractions. Measurements of collagen in serial sections from cadaver liver showed that scattering amounted to 10-20%. With the technique employed, it is possible to determine total collagen in tissue samples as small as 20-30 mg wet weight or 5-8 mg dry weight. Hydroxyproline levels were 10-20 μg in normal livers and more than 100 μg in pathological livers. Preliminary studies demonstrated that the use of prolyl hydroxylase activity as a criterion for collagen synthesis gave significantly different values for patients with cirrhosis and those with normal livers. Although these findings give no information on correlations between the extent of newly formed connective tissue or the prognosis, insight into fibrosis can be obtained if the total collagen content and prolyl hydroxylase activity are determined in needle biopsies.

6120 CYTOCHROME P-450-DEPENDENT 6α-HYDROXYLATION OF TAUROLITHOCHOLIC ACID IN MAN. *(Ger.)* Czygan, P.; Greim, H.; Trultsch, D. (Med. Clin., Univ. Heidelberg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:445-447, 1974.

To demonstrate that cytochrome P450 takes part in 6α-hydroxylation of taurolithocholic acid in normal human liver microsomes, the reaction kinetics, CO inhibition, and the reversibility of CO inhibition by light at 450 nm were investigated. The 6α-hydroxylation of taurolithocholic acid followed Michaelis-Menten kinetics up to a substrate concentration of approximately 0.3 mM. Inhibition occurred at higher concentrations due to the detergent action of taurolithocholic acid. The K_M was 0.21 mM, a value that agrees with those found in other cytochrome P450-dependent reactions, and the maximum reaction rate was 0.79 nM/min/mg microsomal protein. When this reaction was carried out in the presence of 2-48% CO and 4% O_2 for five min at 30 C, inhibition of 6α-hydroxylation increased with increasing CO concentrations. A Warburg distribution constant, K, of 1.8 was obtained at 50% inhibition, a value similar to those reported for other cytochrome P450-dependent reactions. CO-induced inhibition of 6α-hydroxylation was reversed most rapidly when the incubation mixture was exposed to monochromatic light having a wavelength of 450 nm. These findings can be regarded as definite proof that cytochrome P450 takes part in 6α-hydroxylation of taurolithocholic acid. This may be the first demonstrated cytochrome P450-dependent reaction in bile acid metabolism in man. This reaction might be useful in explaining the etiology of intrahepatic cholestasis since drugs which cause this condition and are metabolized by the cytochrome P450-enzyme system would interfere with hydroxylation of taurolithocholic acid. However, it is not known whether this hepatotoxic bile acid would contribute to intrahepatic cholestasis or whether it would only result in potentiation.

6121 HISTOGENETIC STAGES BETWEEN POLYCYSTIC LIVER AND "CONGENITAL HEPATIC FIBROSIS". STUDY OF TWO CASES IN ADULTS. *(It.)* Tomasino, R. M.; Genova, G.; Messina, L. (Inst. Anat. Pathol. Histol., Univ. Palermo, Italy). *Arch. De Vecchi Anat. Patol.* 59(2):261-292, 1973.

Case reports are presented for a 39-yr-old woman with polycystic liver associated with polycystic kidney and a 40-yr-old woman with "congenital fibrosis of the liver." From histological findings it is concluded that these two conditions are actually early and late forms, resp., of the same disease. Laparoscopy of the first patient revealed many cystic protuberances of a greyish-white color, which varied in size from a hazel nut to a hen's egg. A needle biopsy showed dilatation and congestion of the sinusoids; their lumens were filled with many blood cells. Inflammatory infiltrates were present in the periportal region and in the parenchyma; these were associated with diffuse fatty liver and signs of regeneration. The diameters of dilated ductal formations, found in the parenchyma and areas distant from the portal triad, were consistent with those of intralobular bile ducts; these were covered with cylindrical epithelium in which the nuclei were shifted toward the base of the cell and the cytoplasm stained with periodic acid-Schiff's reagent. These structures, which occurred singly or in groups of two or three, consisted only of epithelial covering resting on a very thin fibrous wall surrounded by a layer of hepatocytes; small quantities of bile were present in their cavities. The second patient had a five-yr history of splenomegaly associated with gastrointestinal discomfort. At laparoscopy the spleen and liver were increased in size; the liver was hard, greyish, and "precirrhotic" in appearance. Histological examination of a large fragment of the liver showed thick bands of scarring which separated the parenchyma and surrounded roundish islands of the muralium simplex. In some areas hepatocytes contained lipofuscin pigment. Proliferation of thick bands of connective tissue surrounding the bile ducts was found in all areas examined. As in the first case, proliferation of the intralobular bile ducts was detected; it was not associated with either inflammatory changes or parenchymal necrosis.

6122 A CASE OF ENCAPSULATING PERIHEPATITIS TREATED BY PORTACAVAL ANASTOMOSIS AND HEPATIC DECORTICATION. *(Fr.)* Chevrel, J. P.; Gueraud, J. P. (Franco-Musulman Hosp., Bobigny, France). *Chirurgie* 100(11):806-815, 1974.

A 44-yr-old woman, hospitalized for recurrent hematemesis, had alcoholic cirrhosis associated with portal hypertension and esophageal varices. She had a history of tuberculosis and had undergone nephrectomy on the left 11 yr previously. Clinical examination showed hepatosplenomegaly, conjunctival subicterus, ascites, and Cruveilhier-Baumgarten syndrome. When the peritoneum was opened for omphalography, the liver did not appear nodular and cirrhotic, but resembled the icing of a cake. Although the patient later stopped drinking and gained weight, her liver became more enlarged and she was readmitted to undergo hepatic decortication in association with an end-to-side portacaval shunt. A biopsy of the liver taken at this time confirmed the existence of micronodular cirrhosis associated with moderate steatosis and Curschmann's encapsulating perihepatitis. The patient's recovery was uneventful and one year after surgery her condition has stabilized: the liver is normal in size, liver function tests have improved considerably, and there has been no recurrence of hematemesis, ascites, or edema of the lower extremities; portacaval encephalopathy has not developed, but the patient is currently suffering from polyneuritis.

6123 THE ISOLATION AND CHARACTERIZATION OF PLASMA LIPASE OF HEPATIC ORIGIN: PRELIMINARY CLINICAL FINDINGS IN PATIENTS WITH VARIOUS LIVER DISEASES. *(Ger.)* Klose, G.; Greten, H. (Med. Clin., Heidelberg Univ., Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:1272-1274, 1974.

The activities of a lipase of hepatic origin, which hydrolyzes triglycerides, and of a lipoprotein lipase from fatty tissue were determined in heparinized blood taken from 13 patients with a variety of liver diseases (acute and chronic hepatitis, fatty liver and cirrhosis) and from eight normal controls. Plasma was extracted successively with acetone, heptane, ethanol-ether, and ether at 4 C to remove lipids which normally form a complex with heparin. Proteins were dissolved in barbital buffer (pH 7.4) and incubated with ^{14}C-labeled triolein to which albumin and detergents had been added for 30 min at 27 C. The ^{14}C-labeled free fatty acids were then isolated by passage through an ion-exchange resin and their activity was determined. More than 50 μM/5 ml/hr of free fatty acids were found in total postheparin plasma from seven of the eight controls, while less than 40 μM/5 ml/hr were found in serum from 12 of the 13 patients with liver disease. Calculation of the ratios between triglyceride lipase of hepatic origin and lipoprotein lipase from fatty tissue showed values of less than 2:1 for most of the patients and values as high as 10:1 in the control group. It is suggested that increased triglyceride concentrations in the blood of patients with liver disease are due, at least in part, to a decrease in plasma triglyceride lipase synthesized in the liver.

6124 BILE ACIDS IN THE LIVER AND SERUM IN VARIOUS LIVER DISEASES. *(Ger.)* Greim, H.; Czygan, P. (Toxicol. Inst., Univ. Tubingen, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:443-445, 1974.

So that comparisons could be made between serum and liver bile acids, a technique was developed for determining individual bile acids in needle liver biopsies weighing 5 to 15 mg. Liver was solubilized in 3.4 N KOH which was then neutralized with HCl. Glycine and taurine conjugates were hydrolyzed with 50 μl of cholylglycyl hydrolase in a solution containing 3.5 ml of buffer mixture at pH 5.6 (0.1 M acetate buffer and 0.01 M each of β-mercaptoethanol and EDTA-Na_2). After ether extraction, thin-layer chromatography with a hexane-ethyl acetate (9:1) eluant, and methylation, bile acids were determined by gas-liquid chromatography as their trifluoroacetyl or trimethylsilyl derivatives. Serum bile acids were determined by hydrolyzing 0.5 ml of serum with 3 ml of buffer mixture and enzyme and proceeding as above. Cholic, deoxycholic and chenodeoxycholic acid contents of the liver were compared with their serum concentrations in three patients with liver disease (chronic aggressive hepatitis, sclerosing cholangitis, and cholestasis caused by testosterone) and in six patients with no evidence of liver disease. The ratio of serum to liver bile acid varied between 1:2 and 1:30 so that serum bile acid concentrations give no information about their content in the liver. In part, this can be attributed to the method used which also detects extracellular bile acids. However, with the exception of the patient with chronic aggressive hepatitis, the distribution pattern of bile acids was almost identical in liver and serum. This finding was confirmed in three patients with primary biliary cirrhosis and increased cholic acid levels and in three patients with chronic persistent hepatitis and relatively small increases in bile acid concentrations in both compartments. Therefore, determination of individual bile acids in the serum does give information about the bile acid distribution pattern in the liver.

6125 HEPATIC RETICULOENDOTHELIAL HOST DEFENSE FAILURE FOLLOWING SURGICAL TRAUMA. *(E.)* Scovill, W. A.; Saba, T. M. (Albany Med. Coll., N.Y.). *Arch. Surg.* 110(8):954-959, 1975.

The potential pituitary adrenal influences on postoperative reticuloendothelial function was evaluated in male dogs pretreated with dexamethasone sodium phosphate (3 mg i.m. twice a day for 3 days, with the last dose increased to 6 mg). The operative procedure consisted of right hemicolectomy. The reticuloendothelial function was evaluated by a colloid clearance technique and the plasma opsonic activity was determined before and after surgical trauma by an *in vitro* bioassay. Three hr after surgery significant phagocytic depression was evident in untreated animals by an almost 50% decrease in the global phagocytic index K (vascular clearance of the i.v. injected colloid). There was a 30% decline in opsonic activity. Both the global phagocytic index K and the plasma opsonic activity of control, dexamethasone-pretreated animals were not significantly different than control nontreated animals. In dexamethasone-pretreated dogs, the K value of 0.79 was not significantly changed from control nontraumatized animals. Although opsonic activity declined in the dexamethasone-treated animals, values were not significantly different from control. Cortisone acetate or ACTH over a wide dosage range manifested no depressing effect on *in vitro* phagocytosis. The manipulation of pituitary adrenal function appears to have a substantial postoperative influence on hepatic macrophage function. The precise mechanism of this regulatory influence is unknown but it would appear to be of a hemestatic or permissive nature at the cellular level.

6126 QUANTITATIVE DETERMINATION OF THE ABNORMAL LIPOPROTEIN OF CHOLESTASIS, LP-X, IN LIVER DISEASE. *(E.)* Ritland, S. (Univ. Hosp., Oslo, Norway). *Scand. J. Gastroenterol.* 15(11):5-15, 1975.

Quantitative determination of an abnormal lipoprotein, lipoprotein-X (LP-X) was performed in 15 patients with acute hepatitis, seven with toxic hepatitis, 10 with primary biliary cirrhosis, one with other cirrhosis, two with cholestasis of pregnancy, 10 with sclerosing cholangitis, six with cholecocholithiasis, 30 with extrahepatic biliary obstruction by tumors, and 17 patients with an uncertain diagnosis. Blood samples were drawn in the fasting state, and determinations of LP-X, free and total cholesterol, and α-lipoprotein, serum bilirubin, alkaline phosphatases, albumin, and SGOT were made. Great variations in the plasma LP-X concentration were demonstrated in the 45 patients with intrahepatic cholestasis and in the 36 patients with extrahepatic cholestasis, although the median LP-X concentrations were significantly higher in the former group (158 mg/100 ml) than in the latter group (25 mg/100 ml). However, the highest LP-X level in the intrahepatic cholestasis group (252 mg/100 ml) was exceeded by 42% of the extrahepatic biliary obstruction patients, 33% of whom had plasma LP-X levels greater than 400 mg/100 ml. The plasma LP-X concentration was significantly correlated with free cholesterol, plasma alkaline phosphatases, and serum bilirubin levels, but seemed superior to the latter two parameters in differentiating between intrahepatic and extrahepatic cholestasis. Plasma LP-X concentrations exceeding 400 mg/100 ml are highly indicative of extrahepatic biliary obstruction.

6127 STEROID HORMONES AND THEIR BINDING IN PLASMA OF MALE PATIENTS WITH FATTY LIVER, CHRONIC HEPATITIS AND LIVER CIRRHOSIS. *(E.)* Kley, H. K.; Nieschlag, E.; Wiegelmann, W.; Solbach, H. G.; Kruskemper, H. L. (Med. Univ. Clin., Dusseldorf, Germany). *Acta Endrocrinol. (Kbh.)* 79(2):275-285, 1975.

Plasma estrone (E_1), estradiol (E_2), testosterone (T), cortisol (F), and luteinizing hormone (LH) levels were studied in 10 male patients with fatty liver, six male patients with chronic hepatitis, 15 male patients with cirrhosis of the liver, 25 healthy young (19-40 yr) male subjects, and 25 healthy older males (61-89 yr); the percentage of bound T, E_1, E_2, and F in the plasma was also measured. The plasma E_1, E_2, T, and LH concentrations were measured radioimmunologically using specific antisera, plasma F was determined by the competitive protein binding method, and the percentage of binding of E_1, E_2, T, and F was determined by equilibrium dialysis. The testes were normal in most of the patients with fatty liver and chronic hepatitis, but were small and soft in nine of the cirrhotic patients. Four fatty liver patients, 2 chronic hepatitis patients, and 12 cirrhotic patients complained of reduced potency or impotence, and gynecomastia was found in 10 of the cirrhotic patients. The plasma T concentrations were low normal in the fatty liver patients, reduced below normal levels in two hepatitis patients, and significantly reduced in the cirrhotic patients. The E_2 concentrations were normal in the fatty liver and chronic hepatitis patients and only slightly increased in the cirrhotic patients. The E_1 concentrations were also significantly increased in the cirrhotic patients and the plasma LH levels were increased by 50% over normal values in the hepatitis and cirrhosis patients. The F levels showed no dependence on age or hepatic disease. The percentage of bound T and E_2, but not that of E_1 or F, was also increased in the cirrhosis and hepatitis patients. In comparison with the young controls, the E_2/T ratio was moderately increased in the fatty liver patients, more markedly increased in the hepatitis patients, and greatly increased in the cirrhotic patients; these increases were even more marked in the E_1/T ratio. It is suggested that the combination of elevated E_1 and E_2 and reduced T may be responsible for the gynecomastia and hypogonadism in chronic liver diseases. Furthermore, altered liver function may be responsible for alterations in steroid plasma concentrations and their binding to plasma proteins in both older men and liver disease patients.

6128 BILE ALCOHOL METABOLISM IN MAN: CONVERSION OF 5β-CHOLESTANE-3α,7α,12α,25-TETROL TO CHOLIC ACID. *(E.)* Salen, G.; Shefer, S.; Setoguchi, T.; Mosbach, E. H. (VA Hosp., East Orange, N. J.). *J. Clin. Invest.* 56(1):226-231, 1975.

To study the role of C_{25}-hydroxy bile alcohols as precursors of cholic acid, (G-^{3}H)5β-cholestane-3α,7α,12α,-25-tetrol was administered i.v. to two patients with cerebrotendinous xanthomatosis (CTX) and two normal individuals. One day after pulse labeling, radioactivity was present in the cholic acid isolated from the bile and feces of the CTX subjects and the bile of the normal controls. In the two controls, the specific activity decay curves of (G-^{3}H)cholic acid were exponential, and no traces of (G-^{3}H)5β-cholestane-3α,7α,12α,25-tetrol were detected. In contrast, appreciable quantities of labeled 5β-cholestane-3α,7α,12α,25-tetrol were present in the bile and feces of the CTX patients. The specific activity *versus* time curves of fecal (G-^{3}H)5β-cholestane-3α,7α,12α,25-tetrol and (G-^{3}H)cholic acid showed a precursor-product relation in both groups of subjects. Although these results suggest that 5β-cholestane-3α,7α,12α,25-tetrol may be a precursor of cholic acid in man, the possibility that C_{26}-hydroxy intermediates represent the normal pathway cannot be excluded. The results also support the hypothesis that the genetic abnormality in CTX results in impaired bile acid synthesis, specifically, incomplete degradation of the cholesterol side chain.

6129 SELECTIVE LIGATION OF THE HEPATIC ARTERY FOR TRAUMA OF THE LIVER. *(E.)* Aaron, S.; Fulton, R. L.; Mays, E. T. (Univ. Louisville Sch. Med., Ky.). *Surg. Gynecol. Obstet.* 141(2):187-189, 1975.

The role of ligation of the hepatic artery in obtaining hepatic hemostasis is described in 60 patients over a 12-yr period. The right ramus was ligated in 36 patients, the left ramus in 15 patients, and the common hepatic artery in nine patients. In 55 patients, the artery was ligated on the day of injury at the time of initial laparotomy. Hemostasis and improved hemodynamic status were immediate and permanent in 49 patients. Six patients died in the operating room or immediately after laparotomy from head injury or uncontrolled hemorrhage from nonhepatic sites. Five patients required multiple laparotomies, and hemostasis was achieved in all cases after hepatic artery ligation. In three patients who had hepatic resection as the primary method of treating the hepatic wound, hemorrhage from the liver was profuse following resection. This postresection bleeding was controlled by hepatic artery ligation, and all patients survived. In a fourth patient, who had a severed left lateral segment, left hepatic artery ligation was used in conjunction with resection to successfully control hemorrhage. Seventeen patients died, including two with hemorrhage from perihepatic sites. The most common cause of death was sepsis, primarily subphrenic and pulmonary; six patients died from events unrelated to liver trauma. Hepatic insufficiency did not occur in survivors. It is concluded that ligation of the hepatic artery is an effective method of achieving hepatic hemostasis; it is simple, rapid, and universally applicable with predictable sequelae.

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6207 DOUBLE-BLIND STUDY OF A TOTAL LIVER EXTRACT IN PATIENTS WITH HEPATIC DYSFUNCTION. *(E.)* Preziosi, P.; Nistico, G.; Marano, V. (Inst. Pharmacol., Univ. Naples, Italy). *Int. J. Clin. Pharmacol. Biopharm.* 3(11):210-215, 1975.

6208 PAEDIATRIC LIVER DISEASE. *(E.)* Mowat, A. P. (King's Coll. Hosp. Med. Sch., London, England). *Br. J. Hosp. Med.* 13(1):55-56, 61-64, 1975.

6209 A LARGE HEPATOMA WITHOUT APPARENT ABNORMALITY ON LAPAROTOMY. *(E.)* Tsuzuki, T.; Hasumi, A.; Suguira, Y.; Tsuchiya, M.; Kamegaya, K.; Hiramatsu, K. (Sch. Med., Keio Univ., Tokyo, Japan). *Keio J. Med.* 22(3):137-142, 1973.

See also, 5420, 5616, 5620, 5627, 5630, 5632, 5634, 5636, 5637, 5642, 5666, 5668, 5669, 5672, 5677, 5682, 5696, 5699, 5700, 5816, 6041, 6046, 6211, 6220, 6248, 6304, 6329, 6330, 6344, 6356, 6367, 6378, 6381, 6387, 6388, 6405, 6419, 6427, 6428, 6497, 6506, 6519, 6543, 6549, 6551, 6552, 6556, 6558, 6570, 6571.

LIVER AND BILIARY TRACT

Hyperbilirubinemic States

6210 SLOW INFUSION CHOLANGIOGRAPHY IN PATIENTS WITH JAUNDICE. *(Ger.)* Fuchs, W. A.; Preisig, R. (Inselspital, Bern, Switzerland). *Fortschr. Geb. Roentgenstr. Nuklearmed.* 122(2):148-151, 1975.

A solution of 40 ml (20 g) ioglycamide in 500 ml physiological saline was infused dropwise over a 10 hr period, i.e. at a rate of about 35 mg/min, in 30 fasting patients (19 men and 11 women, aged 20-77 yr) with jaundice caused by a variety of hepatobiliary diseases. All patients had serum bilirubin levels of 4 mg/100 ml or more (1.4-13.6 mg/100 ml), and all were suspected of having extrahepatic biliary obstructions. X-rays were taken with the patients in a prone position, using 75 kilovolts or less, before and 15 min after p.o. administration of 1 g lecithin suspended in 25 ml of an emulsion of egg yolk and glycerol. Tomography was routinely used for better visualization of the gallbladder and bile ducts which, in many cases, filled only slightly. The diagnosis was confirmed by surgical exploration in 18 cases, by histological findings in association with the clinical course in 11 cases, and at autopsy in one case. Slow infusion cholangiography made it possible to establish a correct radiological diagnosis in 11 of 30 patients (38%). While visualization of the extrahepatic bile ducts was good enough to establish a diagnosis in only 2 of 15 patients with extrahepatic biliary obstructions (13%), a radiological diagnosis was made in 9 of 15 patients with parenchymal liver disease (60%).

6211 LONG-TERM PROGNOSIS IN INTRAHEPATIC BILIARY ATRESIA AND IN THE SO-CALLED NEONATAL HEPATITIS. *(Ger.)* Osswald, P.; Gathmann, H.; Muller, G. (Child. Clin., Univ. Tubingen, Germany). *Monatschr. Kinderheilkd.* 123(5):445-447, 1975.

Follow-ups were performed on 20 infants with histologically confirmed neonatal hepatitis and on nine with hypoplasia of the intrahepatic bile ducts.

While rapid regression of the symptoms of neonatal hepatitis was a favorable sign, laboratory examinations performed in initial stages of the disease were of little value in establishing a prognosis. Of the 20 infants (16 boys and four girls) with neonatal hepatitis, nine showed histological evidence of giant cell transformation. In contrast to other reports in the literature, the symptoms and course of infants with giant cell transformation did not differ appreciably from those in the remaining 11 patients. Jaundice developed by age 2 weeks in 2/3 of these patients and, with one exception, maximum total bilirubin values ranged from 4.8 to 18.4 mg/100 ml. In six cases, neonatal hepatitis was associated with other diseases (toxoplasmosis, rubella, hepatitis B, α_1-antitrypsin deficiency and clinically diagnosed Edward's syndrome). Liver damage accompanied by clotting disorders, ascites, edema and, in some cases, in combination with intercurrent infection was the cause of death in the nine patients who died before their first birthday. Two other children died of hepatic coma and esophageal varices, resp., before 4 yr of age. Of these 20 children, only five showed no clinical evidence of residual liver damage at an average age of 6 yr, although the initial stages of cirrhosis were diagnosed histologically during the first four months of life, at which time bilirubin levels and all other liver function tests had normalized. Hypoplasia of the intrahepatic bile ducts, diagnosed in nine infants by histological findings on wedge liver biopsies, followed a benign course in four children; bilirubin levels and other liver function tests normalized by age 3-5 months and no residual clinical symptoms were apparent at ages 1.5 to 8 yr. In the remaining five cases, chronic cholestasis, increased portal fibrosis, and proliferation of the intralobular bile ducts developed along with a secondary disorder in lipid metabolism. The latter was accompanied by great increases in free cholesterol and phosphatide concentrations, a positive lipoprotein X test and significant increases in serum bile acid levels. Only 1/5 children developed

6212 USE OF OXYTOCIN AND INCIDENCE OF NEONATAL JAUNDICE.

(E.) Chalmers, I.; Campbell, H.; Turnbull, A. C. (London Sch. Hyg. Trop. Med., England). *Brit. Med. J.* 2(5963)116-118, 1975.

A retrospective controlled study using data from the Cardiff Births Survey was performed to examine a possible relation between oxytocin administration to induce or accelerate labor and the subsequent development of neonatal jaundice. The study group consisted of 10,591 infants, or 61% of the total live births between 1970-1972, and 95% of those discharged from 3-8 days after delivery. Of the 10,591 infants, 970 (9.2%) had a measured plasma bilirubin of at least 17 μM/liter. Of the 3326 born after oxytocin administration, 412 (12.4%) became jaundiced. Of the 5896 born after spontaneous labor, 476 (8.1%) were affected. Of the 1369 born after amniotomy, 82 (6.0%) developed jaundice. Of the 7265 infants in the latter two groups (no oxytocin), 558 (7.7%) became significantly jaundiced, so that the relative risk of jaundice in an infant born after oxytocin administration compared to the risk in other infants was 1.6. However, analysis by gestational age at delivery, birth weight, Apgar score, length of labor, sedative and analgesic therapy during labor, and suppression of lactation showed that the association between jaundice and oxytocin held within all these categories except among small immature infants who are at high risk of jaundice in any case. The apparent protection against jaundice conferred by amniotomy *versus* spontaneous labor reflected the low incidence of amniotomy at the early gestational age (36 and 37 weeks) which showed a high overall incidence of jaundice. Therefore, the infants born after spontaneous labor and those born after amniotomy were comparable with respect to the incidence of jaundice. These results support the hypothesis that the increasing resort to induction and acceleration of labor has been associated with a higher incidence of neonatal jaundice. It is suggested that this may not be the only enzyme system which is affected.

6213 MICROHETEROGENEITY OF COMPLEX GLYCOSIDES OF BILIRUBIN FROM HUMAN BILE.

(E.) Kuenzle, C. C. (Sch. Vet. Med., Univ. Zurich. Switzerland). *Experientia* 31(6):626-627, 1975.

A chromatographic system was developed to allow the preoperative separation of the aldobiouronide, hexuronosylhexuronide, and pseudoaldobiouronide conjugates of bilirubin on polyamide sheets. Bilirubin conjugates were isolated from human T-tube bile as their phenylazo derivatives, and the aldobiouronide, hexuronosylhexuronide, and pseudoaldobiouronide conjugates were obtained by column chromatography. These preparations were freed from contaminating celite, extracted with 1-butanol and dried. The residue was dissolved in methanol, streaked on polyamide sheets, and developed using a solvent system prepared from 4-methyl-2-penanone. Using this fractionation system, virtually identical chromatographic patterns were obtained for all three azo pigments. Three azo pigment subfractions were visualized in all three instances. Gross estimation of the subfractions gave an approximate intragroup ratio of 5:60:35. The system was not entirely satisfactory, however, in that the azo pigments of lowest mobility were incompletely separated from those of intermediate mobility; also, elution of the subfractions from the plates resulted in partial solubilization of the chromatographic support, thus contaminating the preparations with depolymerizing material. It is concluded that the aldobiouronic, hexuronosylhexuronic, and pseudoaldobiouronic acids involved in bilirubin conjugation are heterogeneous.

6214 FLUOROMETRIC DETERMINATION OF 'ALBUMIN-TITRATABLE BILIRUBIN' IN THE JAUNDICED NEONATE.

(Eng.) McCluskey, S. B.; Storey, G. N. B.; Brown, G. K.; More, D. G.; O'Sullivan, W. J. (Royal Prince Alfred Hosp., Camperdown, N.S.W. 2050, Australia). *Clin. Chem.* 21(11):1638-1643, 1975.

A fluorometric technique is presented for the determination of albumin-titratable bilirubin in the jaundiced neonate. Although bilirubin alone has very little fluorescence, considerable emission is observed in the presence of albumin under acid conditions. Blood samples were obtained from umbilical cord veins or by heelprick from newborn infants. Blood from normal healthy women volunteers was collected by venipuncture. Albumin in the plasma samples was determined by a modified bromcresol green method or, in the case of albumin solutions, by its absorption at 279 nm. Total serum protein was measured by refractive index. Four glass tubes were set up for each blood sample, two containing 40 µl of saline solution and two containing 50 µl of normal human serum or a serum albumin solution (40 g/l). Plasma (10 µl) was pipetted into each tube. A standard bilirubin curve was set up in the range of 0 to 200 mg/l. A tube containing 40 µl of human serum and 10 µl of saline provide a correction factor for the endogenous bilirubin and albumin present in the normal human serum. Phosphoric acid (0.6 ml) was added to the standards and samples and mixed. At least 1 min after mixing, 3 ml of ascorbic acid reagent was added to each tube and mixed again. Fluorescence short-scan measurements were made within 2 hr in quartz cuvets at: excitation 435 nm, excitation slit 6 mm, emission 480 to 520 nm, and emission slit 12 mm. Analysis of the plasma sample alone and in the presence of excess human serum albumin solution appeared to reflect the bilirubin tightly bound to albumin and the total serum bilirubin, resp. The differences between these two values is the albumin-titratable bilirubin. A typical saturation effect was observed with considerable albumin-titratable bilirubin concentrations. In samples where the circulating bilirubin was strongly bound to endogenous albumin, no change was observed when exogenous albumin was added. This method appears to provide a useful supplement to currently available procedures for the assessment of the jaundiced neonate. It is easy to perform, requires only small amounts of plasma, and the results correlate well with the clinical picture.

6215 CALORIC INTAKE AND UNCONJUGATED HYPERBILIRUBINEMIA. *(E.)* Felsher, B. F.; Carpio, N. M. (VA Hosp., Long Beach, Calif.). *Gastroenterology* 69(1):42-47, 1975.

The caloric effect observed in Gilbert's syndrome was investigated to determine its relation to a higher prefasting serum bilirubin level or the underlying uridine diphosphate glycuronyltransferase (UDPG-T) deficiency. UDPG-T assays were performed on liver biopsies from patients with Gilbert's syndrome. Diet studies were performed on 10 patients with Gilbert's syndrome, in 7 patients with hemolysis, and in 13 normal subjects. The subjects fasted for 48 hr prior to measurement of the serum total and direct reacting bilirubin concentration. Two normal subjects were also treated with novobiocin prior to and while fasting. In patients with Gilbert's syndrome and in normal subjects the increase in total serum bilirubin after a 48-hr fast was statistically significant, but the absolute increase in serum bilirubin concentration after a fast was much greater in Gilbert's syndrome compared with normal subjects. In patients with hemolysis, the increase in mean serum bilirubin level after fasting, in spite of a higher mean prefasting level, was significantly less than that obtained in the group with Gilbert's syndrome and only slightly greater than in the normals. Disparate results were obtained in two additional patients with hemolysis and unconjugated hyperbilirubinemia. The reciprocal relations of caloric intake to the serum bilirubin level demonstrated by these patients more closely resembled that observed in the patients with Gilbert's syndrome than the other patients with hemolysis. A comparison of hepatic UDPG-T activities in all subjects showed that the enzymic activities in the two patients with hemolysis and an atypical caloric effect were reduced to levels comparable to Gilbert's syndrome. In two normal subjects, the serum total bilirubin concentrations increased, resp., 0.7 and 0.6 mg/100 ml after novobiocin, and 4.4 and 3.3 mg/100 ml after a combination of fasting and novobiocin. The serum conjugated fractions were not increased. The results indicate that unconjugated hyperbilirubinemia *per se* is not responsible for the exaggerated response in Gilbert's syndrome and suggest that the underlying reduction in UDPG-T activity is the responsible factor. Fasting appears to differentiate Gilbert's syndrome from hemolytic jaundice as well as from normal subjects, irrespective of the initial serum bilirubin concentration.

6216 GLUCOCORTICOIDS AND BILIRUBIN METABOLISM IN JAUNDICE. *(Pol.)* Pirwitz, B. (Clin. Gastroenterol. Metabol., Postgrad. Training Ctr. Phys., Warsaw, Poland). *Przegl. Lek.* 31(10):865-868, 1974.

See also, 5439, 5621, 5624.

LIVER AND BILIARY TRACT

Nonviral Hepatitis and Hepatic Injury

6217 ISONIAZID-ASSOCIATED HEPATITIS: SERUM ENZYME DETERMINATIONS AND HISTOLOGIC FEATURES. *(E.)* Lewis, J. E.; Mello, P.; Knauer, C. M. (Santa Clara Valley Med. Cent., San Jose, Calif.). *West. J. Med.* 122(5):371-376, 1975.

The frequency and severity of the physiologic, histologic, and symptomatic features of isoniazid-associated hepatitis were studied prospectively in 208 patients treated for up to 12 months with isoniazid for tuberculosis prophylaxis. General clinical evaluations and SGOT evaluations were performed on all patients prior to the initiation of isoniazid treatment and 1, 2, 3, 6, 9, and 12 months thereafter. Serum bilirubin, alkaline phosphatase, SGPT, and hepatitis-associated antigen (HAA) were also measured in those with elevated SGOT levels. Elevated SGOT levels developed in 43% of the 47 adults who developed symptoms of hepatitis, 16% of the 109 asymptomatic patients, and 18% of the 142 patients without history of alcohol abuse. Six patients had elevated SGOT levels before initiation of isoniazid therapy, 12 patients with normal pretreatment SGOT levels had single or nonconsecutive elevations in SGOT during therapy, and 19 patients with normal pretreatment SGOT levels had two or more consecutive elevations in SGOT during therapy. The SGPT levels were elevated in eight of these patients, but alkaline phosphatase and bilirubin were generally within normal limits and HAA was negative. Percutaneous liver biopsy was done in eight patients with persistent SGOT elevation during isoniazid therapy; nonspecific hepatitis was evident in five, slight portal fibrosis and early bile duct proliferation were found in another, and mild to moderate microvesicular fatty metamorphosis were observed in the other two. Among the 33 isoniazid-treated children, SGOT abnormalities developed in two. It is recommended that monthly clinical evaluations be made in patients receiving isoniazid. In symptomatic patients, liver function tests should be performed and in cases of prolonged elevations in hepatic enzymes, bilirubin, and/or alkaline phosphatase, isoniazid administration should be discontinued. Liver biopsies may be indicated in these patients, particularly if the liver function parameters do not return to normal values after discontinuation of isoniazid.

6218 INCREASED INCIDENCE OF ISONIAZID HEPATITIS IN RAPID ACETYLATORS: POSSIBLE RELATION TO HYDRAZINE METABOLITES. *(E.)* Mitchell, J. R.; Thorgeirsson, U. P.; Black, M.; Timbrell, J. A.; Snodgrass, W. R.; Potter, W. Z.; Jollow, D. J.; Keiser, H. R. (Lab. Clin. Pharmacol., Natl. Heart Lung Inst., Bethesda, Md.). *Clin. Pharmacol. Ther.* 18(1):70-79, 1975.

To determine whether susceptibility to hepatic injury is correlated with the rapid acetylation of isoniazid, 26 non-Oriental patients who had recovered from probable or possible isoniazid hepatitis were genetically phenotyped as rapid or slow metabolizers of isoniazid, based on their ability to acylate orally administered sulfamethazine (40 mg/kg). Then, to determine whether other differences occur in the metabolism of isoniazid in rapid and low acetylators, radiolabeled isoniazid and acetylisoniazid (5 mg/kg) were given p.o. to seven adult male volunteers, and the urinary metabolites were isolated and identified by paper chromatography and mass spectrometry. Among the 21 subjects who had previously suffered probable isoniazid liver injury, 86% displayed the rapid phenotype for sulfamethazine acetylation. Of the five subjects who had suffered possible isoniazid liver injury, 60% were rapid acetylators; the expected frequency was 45%. Analysis of the urinary isoniazid metabolites in the second study showed that the amounts of isoniazid hydrozones excreted approximately paralleled the isoniazid excretion in both slow and rapid acetylators. However, the excretion of acetylisoniazid and isonicotinic acid and its glycine conjugate were inversely related to the amount of isoniazid excreted. Acetylisoniazid metabolism was the same in both slow and rapid acetylators, no hydrazones being formed after acetylisoniazid administration. It is suggested that the release of the hepatotoxic hydrazino moiety of isoniazid in man is responsible for isoniazid liver injury.

6219 QUINIDINE HEPATITIS. *(E.)* Handler, S. D.; Hirsch, N. R.; Haas, K.; Davidson, F. Z. (Montefiore Hosp. Med. Cent., Bronx, N.Y.). *Arch. Intern. Med.* 135(6):871-872, 1975.

A 72 yr-old woman receiving quinidine (200 mg/6 hr) for 16 months developed abnormal levels of SGOT, alkaline phosphatase and LDH, which returned to normal upon discontinuation of the drug. Upon challenge with 200 mg of quinidine, the levels became abnormal. Prior to therapy, SGOT was within normal limits (10-50 mIU/ml), but 7 months after initiation, SGOT was 367 mIU/ml. During the following 9 months, SGOT ranged from 490 to 795 mIU/ml and the patient suffered anorexia and a 4.5 kg weight loss. At this time, other medications included diphenhydramine, triamterene, hydrochlorothiazide, meprobamate, estrogen, digoxin, nitroglycerin and Ornade. All medications, except digoxin, were discontinued 2 weeks prior to admission. At that time, SGOT was greater than 300 mIU/ml; alkaline phosphatase was raised to 110 mIU/ml, and LDH was raised to 417 mIU/ml. On admission, SGOT was 155 mIU/ml; alkaline phosphatase was 93 mIU/ml and LDH was 220 mIU/ml. Counter immunoelectrophoresis for hepatitis B antigen and antibody was negative. Percutaneous liver biopsy revealed focal areas of hepatocellular necrosis and replacement by Kupffer cells, suggesting active, acute nonspecific hepatitis. After liver function tests returned to normal for 2 weeks, 200 mg of quinidine was given as a challenge. Within 24 hrs, anorexia, vomiting and weakness developed and SGOT climbed to 110 mIU/ml by 72 hrs. Quinidine appears to have a hepatotoxic effect which currently must be labeled as idiopathic.

6220 IS LIVER INJURY PRODUCED BY HIGH-CALORIE INFUSION THERAPY? *(Ger.)* Pfeffer, H. (Surg. Clin., Univ. Giessen, Germany). *Diagnostik* 8(8):307-311, 1975.

After a 12-14 hr fast, five groups of metabolically normal male and female mongrel dogs were infused for 6 hr/day over a 4-day period with the following: (1) 1 ml/kg/hr of 0.9% NaCl; (2) 2 ml/kg/hr of a high-calorie (2.216 kcal/kg/hr) solution containing glucose (0.06 g/kg/hr) + fructose (0.14 g/kg/hr) + xylotol (0.20 g/kg/hr) + ethanol (0.08 g/kg/hr); (3) 4 ml/kg/hr of a high-calorie (4.432 kcal/kg/hr) solution containing glucose (0.20 g/kg/hr) + fructose (0.28 g/kg/hr) + xylitol (0.40 g/kg/hr) + ethanol (0.16 g/kg/hr); (4) 4 ml/kg/hr of the high-calorie solution + 2.5 mg ATP (1.185 mg PO_4^{-3}/kg/hr); and

(5) 4 ml/kg/hr of the high-calorie solution + 0.72 ml Sörensen buffer (14.400 mg/kg/hr PO_4^{-3}). High-calorie solutions also contained Na^+, K^+, Mg^{++}, and Cl^-. On days 1 and 3, the activities of the following enzymes were determined on blood samples taken before infusion and 1, 2, 4, and 8 hr thereafter: SGOT, SGPT, alkaline phosphatase, LDH, leucine aminopeptidase (LAP), γ-glutamyl transpeptidase and cholinesterase. Blood samples were also taken on day 5 before liver biopsies were removed. In group (2), the mean value for SGPT increased significantly above the normal range on days 3 and 5, but SGOT, LDH, and LAP activities remained unchanged, indicating the absence of either liver injury or cholestasis. Peripheral fatty liver was present in 1/6 biopsies. This may have been due to failure of the dog to eat enough or to increase lipolysis induced by ethanol. In group (3), SGOT, SGPT and AP levels were significantly elevated on days 1, 3, and 5, indicating parenchymal liver damage with liver cell necrosis. Fatty liver was present in all dogs and may have been dietary in origin; two dogs had hepatic necrosis. The activities of all serum enzymes studied were considerably lower and liver biopsies showed fewer changes in dogs given high-calorie infusions + phosphate (groups four and five). Increased alkaline phosphatase activities in groups 2-5 were attributed to enzyme induction produced by the initial decrease in serum phosphate concentrations which, in turn, was caused by the high intake of carbohydrates and their metabolization. The hepatotoxic effect of solutions used for high-calorie infusion can be reduced by adding ATP or Sörensen buffer. The dose of phosphate administered is responsible for this effect.

6221 HORMONAL CONTRACEPTIVES AND LIVER DAMAGE.

(Ger.) Otto, G.; Uhlig, K. (Polyclin., Dep. Minist., Berlin, Germany). *Z. Aerztl. Fortbild. (Jena)* 68(21):1181-1183, 1975.

Oral contraceptives have been prescribed for approximately 2000 women with normal histories, no evidence of hepatomegaly, and normal liver function tests. These patients were routinely followed every 6 months to determine SGOT, SGPT, and alkaline phosphatase activities. After taking oral contraceptives for 4-54 months, nine women, aged 20-37 yr, had abnormal liver function tests. A diagnosis of liver injury was confirmed by biopsy, intravenous cholangiography, or a liver specimen taken during cholecystectomy in all but two cases. The findings included diffuse fatty liver (one case), chronic persistent hepatitis (three cases), cholecystolithiasis (two cases), mild parenchymal damage (one case), cholangiolitis (one case), cholesteatosis of the gallbladder (one case), and Dubin-Johnson syndrome (one case). In four cases, patients were able to resume oral contraceptives after liver function tests had normalized. One patient stopped taking oral contraceptives, became pregnant and developed pruritis and increased alkaline phosphatase and SGPT values toward the end of pregnancy. Two months after delivery, oral contraceptives were resumed, but transaminase values increased and chronic persistent hepatitis was found on biopsy; oral contraceptives were discontinued. Oral contraceptives were also discontinued in one patient with cholangiohepatitis and one with Dubin-Johnson's syndrome and in two patients with no histological evidence of liver injury whose transaminase values increased again after a 1-month trial.

6222 PHENYLBUTAZONE AND HEPATITIS.

(E.) Fowler, P. D.; Woolf, D.; Alexander, S. (Med. Dep., Geigy Pharm., Macclesfield, England). *Rheumatol. Rehabil.* 14(2):71-75, 1975.

A case is reported of a patient who developed mild hepatitis during a comparative trial of enteric-coated and rectally administered phenylbutazone in patients with rheumatoid disease. A 69-yr-old woman with rheumatoid arthritis was treated with gold sodium thiomalate, and received a total dose of 1040 mg gold. A course of phenylbutazone was begun 2 months after stopping the gold treatment and 1 month after stopping corticosteroids. Less than 1 month later, she was admitted with epigastric pain, nausea, vomiting and generalized fatigue. On examination she had vesicular lesions similar to those seen in chickenpox; the liver was slightly enlarged and tender and remained so for 21 days. Liver function tests were carried on on two occasions about 1 month later: eosinophilia was 1869 and $4544/mm^3$, resp.; alkaline phosphatase and BSP retention were both elevated above normal limits for more than 1 month after the initial episode. Lymphocyte reactivity tests were carried out to determine the cause of jaundice, and phenylbutazone was identified as the probable causative agent. Close study of the relation of the jaundice to the drug therapy revealed that either phenylbutazone or gold sodium thiomalate malate could be incriminated, especially in view of the relative frequency of gold hepatitis and rarity of phenylbutazone hepatitis. This study indicates the difficulty of interpreting adverse reaction data, and the positive help from the lymphocyte transformation test. It is concluded that this patient should not be again exposed to phenylbutazone or related compounds, and that if gold is thought necessary, a very small test dose should first be given.

6223 JAUNDICE DUE TO ERYTHROMYCIN ESTOLATE.

(E.) Lunzer, M. R.; Huang, S. N.; Ward, K. M.; Sherlock, S. (R. Free Hosp., London, England). *Gastroenterology* 68(5):1284-1291, 1975.

A case of jaundice and abdominal pain associated with erythromycin estolate therapy is reported. A 43-yr-old man received a short course of erythromycin estolate for acute pharyngitis; 1 yr later, he experienced another attack of pharyngitis, and was again placed on the drug (250 mg/8 hr). After 24 hr, he experienced severe epigastric pain requiring hospital admission. After 48 hr, his urine became dark, and he was found to develop jaundice; transaminase and bilirubin values were elevated, and viral hepatitis was considered. A further course of the antibiotic was given on another attack of pharyngitis, and the patient again experienced epigastric pain and jaundice. Electron micrographs were taken of percutaneous liver biopsy before and after challenge with two doses of 250 mg erythromycin estolate. Pre-challenge, the general ultrastructures of the liver cells, bile canaliculi, and interlobular bile ducts were normal. A prominent degree of vesiculation was noted in periportal liver cells. About 20% of bile canaliculi, both in the centrilobular and periportal zones, exhibited a mild degree of dilatation. The portal areas showed inflammatory infiltration with presence of eosinophils immediately around the bile ducts. The results of liver function tests taken after challenge showed elevation of aspartate transaminase, alkaline phosphatase, and serum bilirubin. These findings indicate that many anatomical and cellular factors are involved in the mechanism of erythromycin estolate-induced liver injury, although the precise mechanism is not yet fully understood.

6224 GREY-SCALE ULTRASONOGRAPHY FOR MONITORING INDUSTRIAL EXPOSURE TO HEPATOTOXIC AGENTS. *(E.)* Taylor, K. J. W.; Williams, D. M. J.; Smith, P. M.; Duck, B. W. (R. Marsden Hosp., Sutton, England). *Lancet* 1(7918):1222-1224, 1975.

Preliminary results are reported demonstrating the use of grey-scale ultrasonography in the visualization of pathological lesions of the liver and spleen related to vinyl chloride exposure. Utilizing skin contact with a metallic transducer and a suitable coupling agent such as mineral oil, the liver was scanned in a series of parasagittal sections by moving the transducer through an arc. The resultant scan in a normal subject showed the normal liver consistency and, in a suitable parasagittal plane, a portal vein of normal size and appearance. In patients with portal hypertension, the portal vein was enlarged and tortuous. Although evidence of fatty infiltration and fibrosis was seen in these patients, the pathological appearance of the liver was much less obvious than that seen in patients with cirrhosis and an equivalent degree of portal hypertension. The spleen can be scanned along the 10th intercostal space with the patient lying in the right lateral position. A measure of spleen size can be obtained from the longitudinal axis. When splenomegaly is secondary to portal hypertension, it has a characteristic pattern which may be differentiated from malignant or chronic inflammatory causes of splenomegaly. These data suggest that grey-scale ultrasonography could be valuable for monitoring any liver or spleen changes related to vinyl chloride exposure. Attractive features of the ultrasound apparatus include the potential mobility in a vehicle of similar dimensions to a mobile chest x-ray unit, and the lack of ionizing radiation hazards and domestic power requirements. It is concluded that these features would permit the safe, non-invasive screening of whole populations exposed to potentially hepatotoxic agents.

6225 CARBON TETRACHLORIDE OVERDOSAGE: A CASE REPORT. *(E.)* Kennaugh, R. C. (Frere Hosp., East London, S. Afr.). *S. Afr. Med. J.* 49(15):635-636, 1975.

The successful management of liver and renal failure, ventricular fibrillation, hemorrhagic diathesis, and central nervous system agitation following carbon tetrachloride overdose in a 30-yr-old white male is described. The patient was hospitalized following the ingestion of a number of Carbrital capsules, trichloral, ethanol, and 120 ml of CCl_4. A stomach washout was performed 2 to 3 hr later. Initially 80 mg of furosemide was given i.v. every 8 hr as treatment for renal failure; after 1 day this was increased to 1 g every 12 hr and was stopped on day 5 when diuresis began and KCl was added to the daily i.v. infusion fluid. Treatment for hepatic failure included i.v. vitamin K (20 mg) administration on admission, followed by p.o. vitamin BCo and vitamin C administration and p.o. neomycin administration on day 5. I.v. verapamil (10 mg, twice daily) was given after Digoxin failed to control atrial fibrillation; spontaneous reversion to sinus rhythm occurred on day 22. I.v. (later oral) diazepam (10 mg every 6 hr) was necessary to control the patient's agitation and from day 4, i.v. Solu-Medrol (125 mg twice daily) was administered as a general treatment. The hemoglobin decreased slowly during hospitalization, the white count remaining high until discharge and the platelets falling gradually but increasing prior to discharge (29 days after admission). Most deaths following CCl_4 poisoning occur within 3 to 10 days as the result of massive liver necrosis or acute renal failure. If the toxic effects arising from CCl_4 poisoning are known and looked for, they can be treated successfully *ad initio.*

6226 HALOTHANE HEPATITIS. *(Fin.)* Rosenberg, P.; Yrjola, H. (Anesthesiol. Dept., Univ. Helsinki, Finland). *Duodecim* 91(3):29-38, 1975.

6227 CHOLESTATIC JAUNDICE AND PHENOBARBITAL. *(It.)* Buffoni, L.; De Santis, L. (Giannina Gaslini Inst., Genoa, Italy). *Minerva Pediatr.* 26(25):1278-1281, 1974.

6228 LIVER INJURY IN DRUG-DEPENDENT PATIENTS. *(Ger.)* May, B.; Helmstaedt, D.; Kramer, D.; Lotze, J.; Vido, I.; Schmidt, F. W. (Med. Coll., Hannover, Germany). *Verh. Dtsch. Ge Inn. Med.* 80:1554-1556, 1974.

6229 MEASUREMENT OF LIVER-CADMIUM CONCENTRATIONS IN PATIENTS AND INDUSTRIAL WORKERS BY NEUTRON-ACTIVATION ANALYSIS. *(E.)* Harvey, T. C.; Thomas, B. J.; McLellan, J. S.; Fremlin, J. H. (Dep. Med., Univ. Birmingham, England). *Lancet* (7919): 1269-1272, 1975.

6230 LYMPHOCYTE TRANSFORMATION IN HALOTHANE-RELATED HEPATITIS. *(E.)* Moult, P. J. A.; Adjukiewicz, A. B.; Gaylarde, P. M.; Sarkany, I.; Sherlock, S. (R. Free Hosp., London, England). *Br. Med. J.* 2(5962):69-70, 1975.

6231 ACETAMINOPHEN POISONING AND TOXICITY. *(E.)* Rumack, B. H.; Matthew, H. (Univ. Colorado Med. Cent., Denver). *Pediatr. Clin.* 55(6):871-876, 1975.

6232 HALOTHANE AND JAUNDICE. *(E.)* Simpson, B. R.; Strunin, L.; Walton, B. (London Hosp., England). *Br. J. Hosp. Med.* 13(4):433-436, 1975.

6233 ENCEPHALOPATHY AND FATTY INFILTRATION OF THE VISCERA (REYE-JOHNSON SYNDROME) A 17-YEAR EXPERIENCE. *(E.)* Chaves-Carballo, E.; Gomez, M. R.; Sharbrough, F. W. (Mayo Grad. Sch. Med., Rochester, Minn.). *Mayo Clin. Proc.* 50(4):209-215, 1975.

See also, 5382, 5440, 6003, 6239, 6247.

LIVER AND BILIARY TRACT

Acute Viral Hepatitis

6234 THE BALANCE OF TRACE ELEMENTS IN CHILDREN WITH INFECTIOUS HEPATITIS. *(Ukr.)* Trishkova, L. O. (Kiev Med. Inst., USSR). *Pediatr. Akush. Ginekol.* 35(2):16-18, 1973.

A balance study for trace elements in 20 children (nine boys and 11 girls, aged 6-11 yr) and in five healthy children was performed by spectroanalysis for copper, manganese, vanadium, nickel, and lead in food, feces, urine, and blood. The iron content was determined by the colorimetric Babenko method. It was observed that during illness, infected children receive in general fewer trace elements from their food than healthy children. During acute period of infection, or immediately after, iron, vanadium, nickel, lead, and copper leave the bodies of infected children at increased rates, through feces and urine, so that the balance of the trace elements in the bodies of children with infectious hepatitis is significantly offset, and requires additional supplement.

6235 SEROLOGIC CHARACTERIZATION OF PATIENTS WITH TWO EPISODES OF ACUTE VIRAL HEPATITIS. *(E.)* Karvountzis, G. G.; Mosley, J. W.; Redeker, A. G. (Univ. South. California Sch. Med., Los Angeles). *Am. J. Med.* 58(6):815-822, 1975.

Twenty-eight patients with two distinct episodes of illness compatible with acute viral hepatitis were reviewed to determine if presently available serologic techniques identified both episodes as attributable to hepatitis B virus, either because of recurrence or reinfection. No distinction was found between the first and second bouts with respect to clinical characteristics, abnormalities of liver function or epidemiologic background. Testing of serum specimens obtained during each of the two acute episodes, the interval between the two episodes and the period subsequent to the second, by sensitive procedures for hepatitis B surface antigens (HB_sAg) and their corresponding antibodies (anti-HB_sAg) permitted the following classification: 13 of 28 patients experienced first bouts serologically classifiable as due to hepatitis B virus; 11 had second bouts serologically classifiable as due to the hepatitis B virus; 2 patients had two episodes which were both serologically indeterminate; and 2 patients had two bouts neither of which appeared compatible with hepatitis B virus infection by present criteria. No patient had a second episode for which the HB_sAg and anti-HB_sAg data suggested hepatitis B virus recurrence or reinfection. These results do not favor speculation that the hepatitis B virus can account for repeated episodes of acute icteric hepatitis.

6236 RELATIONSHIP OF HEPATITIS B ANTIGEN IN CIRRHOSIS AND HEPATOMA IN THAILAND. AN ETIOLOGICAL SIGNIFICANCE. *(E.)* Chainuvati, T.; Viranuvatti, V.; Pongpipat, D. (Siriraj Hosp., Bangkok, Thailand). *Gastroenterology* 68(5):1261-1264, 1975.

A study was undertaken to determine the possible relation between hepatitis B surface antigen (HB_sAg), cirrhosis, and hepatoma. In a study of 221 patients, detectable HB_sAg was found in 16.3% of 49 patients who had hepatoma associated with cirrhosis. None of the 8 hepatoma patients without cirrhosis had detectable HB_sAg in the serum. When known causes of cirrhosis were excluded, HB_sAg was present in 18% of 22 patients. Positive α_1-fetoprotein (AFP) was found in 25 of 49 cases (51%) of hepatoma with cirrhosis but was found in only 1 of 8 cases (12.5%) of hepatoma without cirrhosis. Of 25 patients whose AFP was positive, HB_sAg was also present in 7. The latter was detected in only 1 of 24 patients in whom AFP was not detected. These results suggest that HB_sAg is closely associated with hepatomas in cirrhotic patients but not in noncirrhotic patients with hepatoma.

6237 THYMUS-DERIVED LYMPHOCYTES IN TYPE B ACUTE VIRAL HEPATITIS AND HEALTHY CARRIERS OF HEPATITIS B SURFACE ANTIGEN (HB_sAg). *(E.)* Wicks, R. C.; Kohler, P. H.; Singleton, J. W. (Univ. Colorado Med. Cent., Denver). *Am. J. Dig. Dis.* 20(6):518-522, 1975.

To assess thymus-derived (T) lymphocyte function in hepatitis B infection, lymphocytes from 8 patients with acute viral hepatitis type B and 8 healthy carriers of the hepatitis B surface antigen (HB_sAg) were compared with 13 normal controls using phytohemagglutinin-induced blast cell transformation and sheep-cell rosette formation. The patients with acute hepatitis and the healthy carriers had serum HB_sAg detected by immunoelectrodiffusion within 1 week of *in vitro* lymphocyte testing. Overall T lymphocyte cell-mediated immune function was similar with the *in vitro* assays in all three groups, except for decreases in total T cells in 2 patients with acute disease. Consequently, if a defect in cellular immunity exists in normal controls with persistent hepatitis B infection, it is probably specific for the antigens of the hepatitis B virus and not related to a generalized impairment of T-lymphocyte function.

6238 FIBRINOGEN METABOLISM IN ACUTE HEPATITIS AND ACTIVE CHRONIC HEPATITIS.

(E.) Clark, R. D.; Gazzard, B. G.; Lewis, M. L.; Flute, P. T.; Williams, R. (King's Coll. Hosp. Med. Sch., London, England). *Br. J. Haematol.* 30(1):95-102, 1975.

Coagulation studies, including those of radioactive fibrinogen metabolism, were performed in 7 patients with acute viral hepatitis and 12 with chronic active hepatitis. An increased fractional catabolic rate for fibrinogen was observed in 4 patients from the first group, and 7 from the second. In chronic active hepatitis, the catabolic rate was increased in those patients with the greatest degree of hepatic necrosis as demonstrated by raised serum aminotransferase levels. The correlation between the fibrinogen catabolic rate and extent of disease was less clear-cut in acute hepatitis, although the 2 patients with aspartate aminotransferase values >1000 IU/ml had the highest catabolic rates. There was no correlation between the rate of fibrinogen catabolism and the standard clotting tests, but the serial dilution of protamine sulfate test (indicating the presence of fibrin monomers in the circulation) was consistently positive in those cases where the catabolic rate was increased. These data, showing a correlation between an increased fractional catabolic rate and both a positive test for fibrin monomer and the plasma aminotransferase levels in active chronic hepatitis, suggest that this gradation in severity of intravascular coagulation may in some way be related to the severity of hepatic necrosis.

6239 ACUTE FULMINANT HEPATIC FAILURE: POTENTIAL THERAPEUTIC ROLE OF HEMOPERFUSION

(E.) Willson, R. A. (Dep. Med., Univ. Washington, Seattle). *Gastroenterology* 69(1):244-248, 1975.

Hemoperfusion therapy techniques in the treatment of acute fulminant hepatic failure are discussed. The technique consists of perfusing whole blood through columns containing various toxin-removing adsorbants. Charcoal hemoperfusion uses activated charcoal coated with a thin biocompatible membrane to prevent loss of platelets and leukocytes in the charcoal, and to prevent escape of charcoal particles into the circulation. The technique is an extension of standard hemodialysis, and has a theoretically greater dialysance. Its effectiveness is dependent on whether the toxins are water-soluble, whether they will permeate the membrane, and whether they will be adsorbed by the charcoal (urea and ammonia will not). In studies already done, the technique was found to be simple, safe, and well tolerated by the patients. There was a 37% survival rate (of 37 patients with stage IV encephalopathy), as compared to a 13% survival rate (of 97 patients with stage III-IV encephalopathy) without hemoperfusion. Hemoperfusion using cation exchange resins will lower the blood ammonia concentration, but causes a decrease in circulating leukocytes and platelets. Encapsulating the resins with a biocompatible membrane is a probable solution. Anion exchange and uncharged resins have been shown to be superior to dialysis in removing protein-bound BSP, bilirubin, and bile acids; however, loss of leukocytes and platelets is significant. A suggested solution is to first separate the plasma by continuous centrifugation, or to develop more biocompatible resins. Albumin bound to agarose beads has been shown to remove protein-bound substances from blood with a minimal loss of leukocytes and platelets. It is concluded that hemoperfusion is a potentially useful technique in the treatment of acute liver failure.

6240 VIRAL HEPATITIS WITH INTRACYTOPLASMIC CHOLESTASIS AND CHOLESTEROL CRYSTALS IN A DRUG ADDICT.

(E.) Livni, N.; Steigbuegel, D.; Levij, I. S. (Hebrew Univ. Hadassah Med. Sch., Jerusalem, Israel). *J. Pathol.* 116(1):47-50, 1975.

A case is presented of intracytoplasmic cholestasis and cholesterol crystals associated with viral hepatitis. A 16-yr-old female presented with jaundice, mild hepatosplenomegaly, and a temperature of 38 C, associated with upper abdominal pain, anorexia, nausea and vomiting. There was a history of drug abuse, and the patient was known to have used the syringe of a person with jaundice. There was an episode of similar symptoms three months prior to admission. Light microscopy of a liver biopsy showed a few acidophilic bodies and a minimal lymphocytic infiltrate compatible with a diagnosis of viral hepatitis. Thin sections revealed extensive intracellular bile pigment. Electron microscopy revealed focal degeneration of hepatocytes, masses of intracytoplasmic, osmiophilic, electron-dense material (presumably bile pigment), acidophilic round bodies (presumably necrotic cells), and round or oval virus-like particles about 500 to 800 Å in diameter with electron-light cores free in the cytoplasm. Also, numerous elongated, rhomboidal or rectangular empty clefts, 1 to 1.5 cm long,were found in the cytoplasm. They were surrounded by a layer of granular, electron-dense material and apparently represented localizations of cholesterol crystals dissolved during preparation of the tissue. Serum cholesterol level of the patient was normal. It is concluded that the intracellular precipitation of cholesterol crystals may have been due to an abnormal bile salt-cholesterol ratio related to intracellular cholestasis.

6241 HEPATITIS VACCINE: A NOTE OF CAUTION.

(E.) Zuckerman, A. J. (no affil.). *Nature* 225(5504):104-105, 1975.

Current work toward the development of a safe and effective vaccine against viral hepatitis type B is reviewed. The ability of the isolated viral coat protein to challenge the body's immune mechanism in the same way as the whole infectious agent is known, and some research has developed a method for using purified 20 nm hepatitis B surface antigen particles which are free of detectable nucleic acid as immunogens. However, it is known that a variable amount of host protein and perhaps even carbohydrate may be complexed with hepatitis B viral protein in considerable quantities. If this is so, then these host proteins may include various pre-existing structures of the liver cell and may thus induce undesirable immunological reactions. There may be a similarity between the carbohydrate hapten, or the lipoprotein components found in purified fractions of the antigen, and those carbohydrate and lipoprotein antigens of normal cell surfaces, which would lead either to a degree of tolerance, or might initiate an autoimmune reaction. It is indicated that the immunological mechanisms and the presence of antibodies reacting with various tissue components may be involved in the pathogenesis of liver damage. Therefore, it may be undesirable to employ preparations of hepatitis B surface antigen which contain host cell components for immunization against this infection. Careful evaluation of immunization preparations in appropriate non-human primates is essential before small trials are undertaken in human subjects. These experimental trials should be directed not only at the protective efficacy of such immunogens but also should include careful assessment of all their effects on the immune system.

6242 THE RISK OF HEPATITIS FOLLOWING TRANSFUSION OF BLOOD POSITIVE FOR HEPATITIS B ANTIBODIES. *(Ger.)* Schlaak, M.; Lehmann, H.; Schober, H. (Med. Clin., Univ. Kiel, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:469-470, 1974.

Of 48 patients who underwent heart surgery with extracorporeal circulation, 25 developed hepatitis after incubation periods ranging from 28 to 110 days (mean 70 days); tests for hepatitis B antigen (HBAg) or antibody (HBAb) were positive in 90%. These patients received 3 to 42 U of blood (mean, 12.4 U/patient). There was a definite relation between the number of blood units received and the hepatitis risk in this group of patients. By using the maximum likelihood technique, the hepatitis risk was calculated at 50% with 10 U, and the risk/U was 6.4%. Radioimmunoassays showed that HbAg was present in only 1.1% of blood units administered to these patients, but HBAb was detected in 6%. In a larger group of 66 patients, eight had received at least 1 U of HBAg-positive blood and all eight developed hepatitis. Hepatitis occurred in 23 of these 66 patients, and in 14 of the 26 given HBAb-positive blood but in only nine of the 31 receiving HBAb-negative blood. However, ten patients given blood containing neither HBAg nor HBAb also developed hepatitis. By eliminating the use of blood containing either HBAg or HBAb, it is considered that the incidence of hepatitis could be reduced 70 to 80% in patients undergoing open-heart surgery.

6243 CHANGES IN IMMUNOGLOBULINS G, M, AND A AS ACUTE HEPATITIS EVOLVES TO CHRONIC HEPATITIS. *(Ger.)* Berthold, H.; Rotermund, H. M.: Maier, P.; Stiess, G.; Oehlert, W. (Hyg. Inst., Univ. Freiburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:474-476, 1974.

Quantitative immunoglobulin determinations were performed by radial immuno-diffusion on blood from patients with various forms of acute and chronic hepatitis to determine whether there is any relation between the humoral immune reaction in acute hepatitis and the further course of the disease. Patients consisted of 16 with uncomplicated acute hepatitis, six with acute hepatitis persisting for more than 4 months, four with chronic persistent hepatitis of more than 12 months duration, four with chronic aggressive hepatitis who recovered clinically and histologically without treatment, five with chronic aggressive hepatitis which had been observed to evolve from acute hepatitis, and seven with later stages of chronic aggressive hepatitis. Although the number of patients studied is too small to determine whether findings are statistically significant, there appeared to be a correlation between the primary humoral immune response and the course of acute hepatitis. Acute hepatitis in which the initial increase in IgM concentrations was small tended to evolve into the chronic persistent form, while patients with acute hepatitis accompanied by modest increases in immunoglobulin levels and a histological diagnosis of "chronic aggressive hepatitis" may recover spontaneously. Excessive increases in immunoglobulin levels at the onset of hepatitis suggest that evolution to chronic aggressive hepatitis may occur.

6244 SPONTANEOUS LYMPHOCYTE PROLIFERATION IN ACUTE AND CHRONIC HEPATITIS. *(Ger.)* Sodomann, C. P.; Rother, M.; Havemann, K. (Med. Clin., Univ. Marburg, Germany). *erh. Dtsch. Ges. Inn. Med.* 80:1638-1641, 1974.

Lymphocyte proliferation in the absence of phytohemagglutinin (PHA) was studied in peripheral blood cultures from patients with Australia antigen (AuAg)-positive and AuAg-negative acute and chronic hepatitis by measuring ^{3}H-thymidine incorporation. Cultures contained 15% autologous serum or 15% pooled AB serum. Spontaneous lymphocyte proliferation occurred more often than in controls during the first 10 days after the onset of jaundice and before transaminase activities increased in patients with acute hepatitis B. This increase was more pronounced in the presence of homologous, rather than autologous, serum. The reason for this is not clear, but it may be due to the inhibition of increased DNA synthesis by AuAg-positive serum. In later stages of hepatitis B, values returned to the normal range. No difference in spontaneous lymphocyte proliferation was observed between early and later stages of hepatitis A, and there was little difference between results obtained in cultures containing autologous and those containing homologous serum. In all but a few patients with AuAg-positive chronic aggressive hepatitis, spontaneous lymphocyte proliferation was increased; the exceptions were patients with histological evidence of cirrhosis. Values were in the normal range in patients with AuAg-negative chronic aggressive hepatitis and were below the normal range in patients developing cirrhosis. With one exception, lymphocyte proliferation was within normal limits in cultures obtained from patients with chronic persisttent hepatitis, no matter whether AuAg was present or not. Spontaneous lymphocyte proliferation was significantly decreased in cultures from three patients with alcoholic cirrhosis and was greatly increased in cultures from three patients with infectious mononucleosis associated with hepatitis. These findings indicate that a large number of patients with AuAg-positive chronic aggressive hepatitis have lymphocytes which not only show increased reactivity to PHA, but also synthesize DNA at increased rates.

6245 IMMUNOGLOBULINS AND AUSTRALIN ANTIGEN IN VARIOUS FORMS OF HEPATITIS AND IN CIRRHOSIS. *(Ger.)* Reis, H. E.; Bertrams, J.; Selmair, H.; Wiese, W.; Kuwert, E.; Hirche, H. (Munic Hosp., Kassel, Germany). *Med. Welt.* 25(31-32):1277-1279, 1974.

Immunoglobulins were measured by radial immunodiffusion and hepatitis B antigen (HBAg) titers by the complement fixation reaction on blood from patients with various forms of acute and chronic hepatitis and cirrhosis to determine whether there is an inverse correlation between immunoglobulin levels and the appearance of HBAg. Blood was taken from 46 patients with acute and 25 with protracted hepatitis, 46 with chronic persistent and 58 with chronic aggressive hepatitis, 49 with cryptogenic and 18 with posthepatitic cirrhosis, and from 93 controls. Statistical analysis was performed logarithmically since, with the Kolmogoroff-Smirnoff test, immunoglobulin values are better described by a logarithmic, rather than a nonlogarithmic, normal distribution. Individual geometric means were compared by using the Duncan test. In chronic aggressive hepatitis and cryptogenic and posthepatitic cirrhosis, mean IgG and IgA values were significantly higher than in controls. IgG levels were also increased, but not to the same extent, in acute hepatitis. The greatest increases in IgM levels occurred in acute and protracted hepatitis, but significant increases were also apparent in chronic aggressive hepatitis and cryptogenic and posthepatitic cirrhosis; a smaller, but still significant, increase occurred in chronic persistent hepatitis. HBAg was detected in 43.4% of patients with acute hepatitis, 37.0% with protracted hepatitis, 72.6% with chronic persistent hepatitis, 48.0% with chronic aggressive hepatitis, and in 26.7% of the patients with both forms of cirrhosis. A comparison of immunoglobulin values in HBAg-positive blood with those in HBAg-negative blood showed no significant differences for any of the three immunoglobulins in any of the diseases considered. Similarly, no correlation was found between HBAg titers in chronic persistent and chronic aggressive hepatitis and the individual immunoglobulin levels. These findings conflict with others reported in the literature. Since no relation was observed between elimination of HBAg and immunoglobulin levels, increases in immunoglobulin levels occuring in various forms of hepatitis and cirrhosis must be induced by other antigens. It is suggested that the almost complete lack of immune response in chronic persistent hepatitis and reduced HBAg elimination in chronic aggressive hepatitis may be genetically determined, possibly by antigens in the histocompatibility system.

6246 HEPATITIS-B VIRUS AND INDIAN CHILDHOOD CIRRHOSIS. *(E.)* Nayak, N. C.; Roy, S.; Ramalingaswami, V.; Sachdeva, R. (All India Inst. Med. Sci., New Delhi). *Lancet* 2(7925):109-111, 1975.

Electron microscopy and immunospecific and orcein staining procedures were used to look for the components of hepatitis-B virus in the livers of children suffering from Indian childhood cirrhosis. The material consisted of 9 necropsy samples, 15 percutaneous needle biopsies, and 5 fresh-frozen liver biopsies. Immunostaining revealed neither the core nor surface component of hepatitis-B virus in any of the livers, and orcein staining from hepatitis-B antigen was also negative in all but one case. Coarse nonantigen granules, characteristic of degeneration hepatocytes, were often present, particularly in the necropsy material. Electron microscopic examined revealed no particles conforming in ultrastructural appearance to the hepatitis-B virus core antigen, although in a few cases occasional hepatocytes showed nonviral inclusions. The hepatocytic cytoplasm showed marked degenerative changes in the various organelles, but no proliferation of the smooth endoplasmic reticulum and no intracisternal structures resembling hepatitis-B surface antigen. These data, in conjunction with the other features of the disease, suggest that hepatitis-B virus infection plays no significant role in the etiology of Indian childhood cirrhosis.

6247 HEPATIC DYSFUNCTION IN RECIPIENTS OF RENAL ALLOGRAFTS. *(E.)* Berne, T. V.; Chatterjee, S. N.; Craig, J. R.; Payne, J. E. (Univ. Southern California Sch. Med., Los Angeles). *Surg. Gynecol. Obstet.* 141(2):171-175, 1975.

Findings of hepatic dysfunction in 18 of 42 recipients of renal allografts were analyzed with particular emphasis on the cause and results of altering the drug therapy. Following transplantation, immunosuppresive therapy consisted of prednisone and azathioprine. After an initial dose of 5 mg/kg of azathioprine, the patients received maintenance doses between 2.5 and 3.0 mg/kg/day. Prednisone was given at a dose of 2 mg/kg/day, tapered to 0.5 mg/kg/day by the end of the first month, and was reduced to 0.3 mg/kg/day by 6 months. Rejection was treated i.v. with methylprednisolone pulse therapy and the reinstitution of higher p.o. doses of prednisone. Hypertension frequently was treated with up to 2 g of methyldopa/day. Patients with thoracic roetgenographic evidence of primary pulmonary tuberculosis were given 300 mg of isoniazid/day. Evidence of a hepatic dysfunction was based on serum transaminease levels greater than 200 IU or total serum bilirubin levels greater than 2 mg%. In ten patients, hepatic dysfunction occurred while the clinical course and renal function were otherwise stable. In this group, cyclophosphamide was substituted for azathioprine, and other potentially hepatotoxic drugs were discontinued. Indexes of hepatic function improved in all of these patients, and there was no deterioration of renal function. Of 11 patients with hepatic tissue available for histopathologic study, six demonstrated changes suggestive of viral hepatitis. Two had cholestasis, suggestive of drug injury, while in three others, changes were nonspecific. Only three of the 18 patients with hepatic dysfunction were persistently hepatitis B surface antigen-positive as measured by counterimmunoelectrophoresis. Cytomegalovirus was grown from the blood within 1 month after the first detection of abnormalities of the liver in five patients, and complement-fixing antibody titer rose in six of eight patients studied. All of the five patients with a histopathologic finding of viral hepatitis had evidence of cytomegalovirus infection, while none was positive for hepatitis B surface antigen. Although there is no clear cause for the hepatic dysfunction of renal allograft recipients, the results show that discontinuation of potentially hepatotoxic drugs is associated with improvement.

6248 ANTIBODY TO HEPATITIS-B CORE ANTIGEN IN PATIENTS WITH PRIMARY HEPATIC CARCINOMA. *(E.)* Maupas, P.; Larouze, B.; London, W. T.; Werner, B.; Millman, I.; O'Connell, A.; Blumberg, B. S.; Saimot, G.; Payet, M. (Fox Chase Cancer Cent., Philadelphia, Pa.). *Lancet* 2(7923):9-11, 1975.

Antibody to hepatitis-B core antigen (anti-HB_c) was assayed in the serum of 153 patients with primary hepatic carcinoma and in 238 controls from Hong Kong, West Africa, and the United States. All sera were tested by counter-electrophoresis and immunodiffusion against hepatitis-B core antigen (HB_cAg) extracted from the liver of a patient with chronic hepatitis. Sera which gave equivocal results were then tested by counter-electrophoresis against HB_cAg Amicon concentrate. Anti-HB_c was detected in 114 of the primary hepatic carcinoma patients, the percentage of positive patients being over 90% in Senegal and about 70% in Mali and Hong Kong. Of 21 American patients, only five were positive for anti-HB_c and one of these was Chinese while another was Puerto Rican. Among the controls, 20-68% of those from Asia and Africa were positive for anti-HB_c, while only 4% of those from the United States were positive. The data, in conjunction with previous findings, support the hypothesis that chronic infection with hepatitis-B virus is etiologically related to primary hepatic carcinoma, especially in Asia and Africa, although other factors must also be involved. With the development of a vaccine against the hepatitis-B virus, prevention of many cases of primary hepatic carcinoma may, therefore, be a realistic expectation.

6249 LYMPHOCYTE STIMULATION IN HEPATITIS B INFECTIONS. *(E.)* Tong, M. J.; Wallace, A. M.; Peters, R. L.; Reynolds, T. B. (Univ. Southern California Sch. Med., Los Angeles, Calif.). *N. Engl. J. Med.* 293(7):318-321, 1975.

Cell-mediated responses in patients with acute and chronic forms of Type B hepatitis were tested by lymphocyte transformation to purified hepatitis surface antigen (HB_sAg) and to phytohemagglutinin by dinitrochlorobenzene sensitization and by response to skin test antigens. Stimulation of human peripheral lymphocytes by purified HB_sAg or phytohemagglutinin was measured by uptake of ^3H-thymidine. During the acute phase of Type B hepatitis, lymphocyte transformation to HB_sAg was not detected in any patients. However, all acquired *in vitro* lymphocyte reactivity to HB_sAg during the early recovery period when SGPT levels and circulating HB_sAg titers were declining. Patients with Type B chronic active hepatitis and carriers of HB_sAg and patients with chronic persistent hepatitis uniformly showed no lymphocyte transformation to HB_sAg. Lymphocyte transformation to phytohemagglutinin was normal in all groups studied. Primary sensitization with topical application of 2000 μg of dinitrochlorobenzene was achieved in all six patients during the acute phase of Type B hepatitis. A delayed skin reaction to dinitrochlorobenzene developed in eight patients with Type B chronic active hepatitis and seven patients with chronic persistent hepatitis and HB_sAg carriers who were tested. The results support the hypothesis that the clinical course of hepatitis B virus infection depends on the competency of the thymus or T-dependent lymphocyte system. Recovery from acute Type B hepatitis is associated with the development of a specific cell-mediated response to purified HB_sAg during the early convalescent period.

6250 AGE DEPENDENCE OF THE OCCURENCE OF AUSTRALIA ANTIGENAEMIA IN PATIENTS WITH VIRAL HEPATITIS. *(Pol.)* Boron, P.; Sokolewicz, E.; Kossakowski, R. (Clin. Infectious Dis., Med. Acad., Bialystok, Poland). *Przegl. Lek.* 31(8):725-728, 1974.

6251 COMPARISON OF ULTRASTRUCTURAL AND IMMUNOHISTOCHEMICAL FEATURES OF HEPATOCYTES IN HBAg CARRIERS. *(It.)* Caramia, F.; Turbessi, G.; DeBac, C.; Ricci, G. (Inst. Gen. Pathol. II, Univ. Rome, Italy). *Boll. Ist. Sieroter. Milan* 53(3): 472-484, 1974.

6252 ABORTIVE INFECTIOUS HEPATITIS IN CHILDHOOD. *(Ger.)* Meinhard, F.; Herms, G. (Pediatr. Clin., Magdeburg-Altstadt Dist. Hosp., Germany). *Z. Gesamte Inn. Med.* 30(5):188-194, 1975.

6253 PREVALENCE OF HEPATITIS B ANTIGEN IN RESIDENTS AND HEPATITIS PATIENTS IN PERU. *(Sp.)* Ishida, N.; Umenay, T.; Miyamoto, T.; Mejia, J.; Flores, W.; Sanchez, S.; Mendez, R. (National Inst. Health, Univ. San Marcos, Lima, Peru). *Bol. Of. Sanit. Panam.* 78(5):445-451, 1975.

6254 ASSESSMENT OF PHAGOCYTIC ACTIVITY OF LEUCOCYTES IN VIRUS HEPATITIS. *(Pol.)* Kiczka, W.; Szkaradkiewicz, A. (Clin. Infect. Dis., Inst. Intern. Dis., Poznan, Poland). *Pol. Tyg. Lek.* 29(46): 1979-1982, 1974.

6255 FULMINANT VIRAL HEPATITIS. *(E.)* Williams, R. (no affiliation given). *Clin. Gastroenterol.* 3(2):419-436, 1974.

6256 VIRAL HEPATITIS: RECENT ADVANCES IN ITS PREVENTION. *(Fr.)* Vieira, J. (no affil.). *Recherche* 5(44):382-383, 1974.

6257 TREATMENT OF ACUTE VIRAL HEPATITIS. *(Ger.)* Franken, F. H. (St. Joseph Hosp., Wuppertal-Elberfeld, Germany). *Med. Welt* 25(46):1901-1904, 1974.

6258 ASPECTS OF THE ANAMNESIS AND CONCOMITANT DISEASES IN PATIENTS WITH VIRAL HEPATITIS. *(Rus.)* Demidova, A. N. (Dept. Infect. Dis., Ivano-Frankovsk Med. Inst., USSR). *Vrach. Delo* 616(2): 145-146, 1975.

6259 OZOKERITE THERAPY IN CHILDREN WITH VIRAL HEPATITIS. *(Rus.)* Rasnitsina, I. E.; Pisarev, A. G. (Dept. Infectious Infantile Dis., N. I. Pirogov Second Moscow Med. Inst., USSR). *Vopr. Okhr. Materin. Det.* 19(12):11-14, 1974.

6260 CLINICAL SIGNIFICANCE OF DETECTION OF THE AUSTRALIA ANTIGEN IN CHILDREN WITH VIRAL HEPATITIS. *(Rus.)* Petrunin, Y. P. (Dept. Infectious Infantile Dis., N. I. Pirogov Second Moscow Med. Inst., USSR). *Vopr. Okhr. Materin. Det.* 19(12):7-10, 1974.

6261 SOME PECULIARITIES OF THE CLINICAL PICTURE AND PATHOGENESIS OF INFECTIOUS AND SERUM HEPATITIS IN CHILDREN. *(Rus.)* Nisevich, N. I.; Bokova, A.G.; Petrunin, Y. P.; Cherednichenko, T. V.; Fedotov, V. V.; Nechaeva, T. A.; Pisarev, A. G. (Dept. Infectious Infantile Dis., N. I. Pirogov Second Moscow Med. Inst., USSR). *Vopr. Okhr. Materin. Det.* 19(12):3-6, 1974.

6262 EMPLOYMENT OF GAMMAGLOBULIN FOR THE PROPHYLAXIS OF RESIDUAL PHENOMENA AND COMPLICATIONS IN VIRAL HEPATITIS CONVALESCENTS. *(Rus.)* Latenko, Y. P.; Ziva, V. K. (Dept. Infectious Dis., N. I. Pirogov Vinnitsa Med. Inst., USSR). *Vrach. Delo.* 616(2):148-150, 1975.

6263 THE USE OF LAPAROSCOPY AND DIRECTED LIVER BIOPSY FOR THE STUDY AND DIFFERENTIAL DIAGNOSIS OF VIRAL HEPATITIS. *(Rus.)* Galperin, B. L.; Krichevskii, Iu. A.; Usviatsev, Ia. A. (Hosp. Infect. Diseases No 22, Kharkov, USSR). *Vrach. Delo* (4):117-119, 1975.

6264 MANIFESTATIONS OF THE HEPATO-RENAL SYNDROME IN VIRAL HEPATITIS. *(Rus.)* Nikiforov, V. N.; Latsinik, G. E. (Dept. Infectious Dis., Central Inst. Postgrad. Training Phys., Moscow, USSR). *Sov. Med.* (11):89-93, 1974.

6265 VIRAL HEPATITIS AND CIRRHOSIS. *(E.)* Bjorneboe, M. (no affiliation given). *Clin. Gastroenterol.* 3(2):409-418, 1974.

6266 ETIOLOGICAL SPECTRUM OF POST-TRANSFUSION HEPATITIS. *(E.)* Knodell, R. G.; Bell, C. J.; Conrad, M. E. (Dep. Hematol., Walter Reed Army Inst. Res., Washington, D.C.). *Gastroenterology* 68(4):927, 1975.

6267 HYPOGLYCEMIA AND AGLYCEMIA IN VIRAL HEPATITIS. *(Ger.)* Lindner, W. (Munic, Hosp., Salzgitter-Lebenstedt, Germany). *Munich. Med. Wochenschr.* 117(20):855-860, 1975.

6268 THE FRUCTOSE-1-PHOSPHATE ALDOLASE IN THE DIAGNOSIS OF AND PROGNOSIS FOR VIRAL HEPATITIS IN CHILDREN. *(Rus.)* Balabonkin, V. G.; Milman, M. Sh.; Uzbekova, Kh. Z. (Uzbek. Res. Inst. Pediatr., Tashkent, USSR). *Vopr. Okh. Materin. Det.* 19(11):85, 1974.

6269 THE DIAGNOSIS AND TREATMENT OF CHOLESTATIC FORMS OF VIRAL HEPATITIS. *(Fr.)* Vachon, A. (Hotel Dieu, Lyon, France). *Cah. Med.* 15(15):1071-1077, 1974.

6270 DEVELOPMENT DISORDERS CAUSED BY VIRAL HEPATITIS IN YOUNG PATIENTS. *(Fr.)* Laverdant, C.; Molinie, C. (Begin Hosp., St. Mande, France). *Cah. Med.* 15(15):1049-1063, 1974.

6271 THE SUBTYPES OF HEPATITIS B ANTIGEN (AUSTRALIA ANTIGEN). *(Ger.)* Frank, K. H.; Reimann, W.; Renger, F. (Carl Gustav Carus Med. Acad., Dresden, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(2-4):245-247, 1974.

6272 THE DANGEROUS INCREASE IN ACUTE AND CHRONIC LIVER DISEASE. *(Ger.)* Muting, D. (no affil.). *Fortschr. Med.* 93(8):393-394, 1975.

6273 DISTRIBUTION PATTERN OF AUSTRALIA ANTIGEN SUBTYPES D AND Y IN LIVER DISEASE. *(Ger.)* Schoppe, W. D.; Kindler, V. (Med. Clin., Univ. Dusseldorf, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80: 463-465, 1974.

6274 COMPARISON OF LABORATORY FINDINGS IN ACUTE HB-Ag-POSITIVE AND HB-Ag-NEGATIVE HEPATITIS. *(Ger.)* Linhart, P.; Kommerell, B.; Erbe, R.; Schneid, M. (Med. Clin., Univ. Heidelberg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:471-472, 1974.

6275 THE CURRENT EPIDEMIOLOGICAL STATUS OF VIRAL HEPATITIS IN THE HANNOVER AREA. *(Ger.)* Wehrmann, M.; Muller, R.; Kramer, R.; Willers, H.; Knocke, K. W.; Deicher, H.; Hopken, W. (Med. Coll., Hannover, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:510-513, 1974.

6276 FLUORESCENCE SEROLOGICAL DETECTION OF HEPATITIS B-ASSOCIATED ANTIGEN (Au Ag) IN PERIPHERAL BLOOD CELLS: FOLLOW-UP STUDIES IN ACUTE HEPATITIS AND CONTROLS WITH NORMAL LIVERS. *(Ger.)* Arnold, W.; Volker, K.; Meyer zum Buschenfelde, K. H. (Med. Clin., Univ. Mainz, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:461-463, 1974.

6277 CLINICAL PROBLEMS OF THE AUSTRALIA ANTIGEN (HEPATITIS-B-ANTIGEN). *(Ger.)* Kaboth, V. (Clin., Univ. Gottingen, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:344-349, 1974.

6278 THE CLINICAL VALUE OF DETERMINING HEPATITIS B ANTIBODIES. *(Ger.)* Lehmann, H.; Schober, A.; Schlaak, M. (Med. Clin., Univ. Kiel., Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:456-457, 1974.

6279 REPLICATION OF HEPATITIS B VIRUS IN CELL CULTURES. *(Fr.)* Panouse-Perrin, J.; Courouce-Pauty, A. M. (no affil.). *Ann. Immunol. (Paris)* 126 C(1):100-101, 1975.

6280 EPIDEMIOLOGY AND PREVENTION OF VIRAL HEPATITIS. *(Fr.)* Cappel, R. (no affil.). *Brux. Med.* 55(1):17-22, 1975.

6281 SERUM ENZYME ACTIVITY IN PATIENTS OF DIFFERENT AGE GROUPS WITH VIRAL HEPATITIS. *(Rus.)* Botsvadze, E. S.; Katsitadze, T. K.; Tavartkiladze, D. A. (Tbilisi Med. Inst., USSR). *Lab. Delo* (12):720-722, 1974.

6282 CLINICAL EVALUATION OF ENZYME UV-TESTS AND BIO-LA-TESTS USED IN COMBINATION WITH ULTRA-MICROSYSTEM FOR EXAMINATION OF PATIENTS WITH VIRAL HEPATITIS. *(Rus.)* Luchshev, V. I.; Lezhnev, I. A. (Moscow 2nd Med. Inst., USSR). *Lab. Delo* (3):144-145, 1975.

6283 METABOLISM OF SOME AMINO ACIDS AND UREA IN THE BLOOD SERUM IN INFECTIOUS HEPATITIS. *(Rus.)* Khochava, A. I.; Vasiliev, V. S. (Grodno Med. Inst., USSR). *Lab. Delo.* (3):142-143, 1975.

6284 CHANGES OF SOME INDICATORS OF NONSPECIFIC IMMUNOLOGICAL REACTIVITY IN CHILDREN WITH VIRAL HEPATITIS. *(Ukr.)* Zakrevskii, N. N. (Kharkov Med. Inst., USSR). *Pediatr. Akush. Ginekol.* 37(2):27-29, 1975.

6285 ACUTE SPORADIC HEPATITIS IN THE ADULT: CLINICAL, ETIOLOGICAL AND PROGNOSTIC CONSIDERATIONS ON FOLLOW-UP CASES WITH TYPICAL AND ATYPICAL SYMPTOMS. *(It.)* Coltorti, M.; Del Vecchio-Blanco, C.; Caporaso, N. (Fac. I. Med. Chir., Univ. Naples, Italy). *Recent Prog. Med. (Roma)* 56(3):238-274, 1974.

6286 TRANSPORT OF THE HEPATITIS B ANTIGEN. IMMUNOFLUORESCENCE STUDIES ON THE LOCATION OF THE ANTIGEN IN THE LIVER. *(It.)* Turbessi, G.; De Bac, C.; Caramia, F.; Ricci, G. (Inst. Infect. Dis., Univ. Rome, Italy). *Recent. Prog. Med. (Roma)* 56(3):212-229, 1974.

6287 INDEPENDENT EXTRAHEPATIC MANIFESTATIONS OF THE DISEASED LIVER IN VIRAL HEPATITIS. *(Fr.)* Paris, J. (no affil.). *Lille Med.* 19(10):1015-1034, 1974.

6288 KINETICS OF HB_S ANTIGEN IN MAN. *(E.)* Drouet, J.; Courouce-Pauty, A. M.; Thevenoux, A. M.; Soulier, J. P.; Chanard, J.; Vallee, G.; Funck-Brentano, J. L. (Necker Hosp., Paris, France). *Biomedicine* 22(2):158-166, 1975.

See also, 5466, 6143, 6506.

LIVER AND BILIARY TRACT

Chronic Hepatitis

6289 LONG-TERM IMMUNOSUPPRESSIVE THERAPY IN CHRONIC AGGRESSIVE HEPATITIS AND CIRRHOSIS. *(Ger.)* Bannaski, H. (Kempfenhausen Priv. Clin., Germany). *Med. Welt* 25(39):1551-1555, 1974.

Changes in histological findings, transaminase values, immunoglobulins, and clinical findings were compared in 212 patients with chronic aggressive hepatitis or compensated or decompensated cirrhosis who received immunosuppressive agents and in 88 patients who received conservative therapy (bed rest, diet, and various infusions and anabolic and hepatotropic agents) for 3 months to 10 yr. Of these patients, 52% were men and 48% were women; 69% were more than 50 yr old and only six were younger than 30 yr. Immunosuppressives were given to patients with autoimmune diseases, primary biliary cirrhosis, and to patients with negative immunological findings who failed to respond to conservative therapy. Most patients in this group received cyclophosphamide or azathioprin, but some were given D-penicillamine and/or corticosteroids. A combination of azathioprin and corticosteroids is particularly recommended for cirrhosis. Initial doses of azathioprin were 50-150 mg, combined with 4-24 mg of corticosteroids. Corticosteroid dosages were then reduced as rapidly as possible to prevent serious side effects. Among patients given immunosuppressives, transaminase values improved in 90%, immunoglobulin G values improved in 80%, and histological findings improved in almost 70%. No comparable values were reported for patients receiving conservative therapy. Improvements occurred in 71% of 36 patients with compensated cirrhosis who received immunosuppressives and in 67% of 21 patients with decompensated cirrhosis. Leukopenia and thrombopenia were observed in 28% of patients given immunosuppressives, but were reversible when drug therapy was discontinued. Septicemia, mycosis, complete alopecia and gastric bleeding were observed in one patient each. Of eight patients with primary biliary cirrhosis, two died of cerebrovascular accidents, which were considered to have resulted from extremely high cholesterol levels after 7 and 9 yr of immunosuppressive therapy, resp.

6290 COMPLEMENT DETERMINATIONS IN LIVER DISEASE. *(Ger.)* Opferkuch, W.; Berger, J.; Forster, E.; Hopf, U.; Meyer zum Buschenfelde, K. H. (Dep. Med. Microbiol., Ruhr Univ. Bochum, Germany). *Z. Gastroenterol.* 13(suppl.):282-284, 1975.

Determinations of the fourth component of complement (C_4) were performed on 79 patients with histologically confirmed chronic active hepatitis, and the values were compared with those previously measured on normal controls. Since the mean C_4 concentration was only slightly decreased in chronic active hepatitis, the concentrations obtained were plotted against the percentage of patients having each concentration to obtain a distribution curve. t the maximum for the control curve, the curve for patients with hepatitis had a shoulder, suggesting hat this group of patients contained at least two ubgroups. Curves were then plotted for Australia ntigen (AuAg)-positive and AuAg-negative patients. While the curve for AuAg-positive patients followed he normal distribution, C_4 concentrations were decreased in AuAg-negative patients, but the latter group also included patients with normal C_4 concenrations. Since C_4 and the second component of omplement (C_2) are both produced in cells of the mononuclear, phagocytic system and since a similar ecrease did not occur in C_2 concentrations in AuAg-negative patients with chronic active hepatitis, t is concluded that decreased C_4 concentrations n these patients are not caused by a disorder in he synthesis of complement.

6291 CHRONIC AGGRESSIVE HEPATITIS IN CHILDHOOD. *(Ger.)* Scholz, H. (Munic. Clin., Berlin-Buch, Germany). *Kinderaerztl. Prax.* 42(11): 87-494, 1974.

In a 7-yr period, seven children (five girls and two boys, aged six months to 9.2 yr at onset) were treated for chronic aggressive hepatitis. These patients were followed for 1.7 to 7.2 yr (mean, 5.0 yr). At onset, two children had acute viral hepatitis; two others, who were completely asymptomatic, were suspected of having subclinical hepatitis because of close contact with a hepatitis patient. The other three patients were suspected of recurrences of chronic hepatitis. Hepatomegaly was present in 4 cases and splenomegaly in only one. Increased SGPT activities were the most useful laboratory test in diagnosing recurrences. Australia antigen was detected in five of these patients; the first test for this antigen was made only 4 yr after onset in the two patients with negative findings. Signs of aggressive hepatitis were found in only one of the 12 to 15 biopsies performed on three children. One patient had cirrhosis on laparoscopy, but not on biopsy. Azathioprin alone, given to three patients, produced no improvement so it was combined with prednisolone. Two of these patients gradually responded after 6 months and 1 yr, resp., but no effect was noted in the remaining child and he had a severe recurrence lasting many months. All children received prednisolone, which appeared to give better results than azathioprin, but no convincing evidence was obtained that it had any long-term effect on progression of the disease and some serious side effects occurred (steroid diabetes, bone changes, infections).

6292 INCREASED DNA SYNTHESIS IN LYMPHOCYTES IN CHRONIC ACTIVE HEPATITIS. *(Ger.)* Muerker-Alzer, G.; Schumacher, K.; Gross, R. (Med. Clin., Univ. Cologne-Lindethal, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:1636-1638, 1974.

DNA synthesis was studied by measuring ^{14}C-thymidine incorporation in the absence of phytohemagglutinin(PHA) in 48-hr peripheral lymphocyte cultures from 76 patients with chronic aggressive hepatitis or active cirrhosis. In cultures from 24 of these 76 patients the rate of DNA synthesis was significantly faster than that in cultures from 48 controls. No correlation was found between this increase in DNA synthesis and any of the immunological parameters studied (immunoglobulins; antinuclear, antiglomerular, or antivascular antibodies; or hepatitis B antigen or antibody). PHA stimulation was not reduced in patients with *in vivo*-activated lymphocytes. In follow-up examinations, performed on 12 patients with *in vivo*-activated lymphocytes, clinical improvements, which occurred in four cases, were accompanied by normalization of resting DNA synthesis. No appreciable change occurred in lymphocytes from the remaining eight patients who died in hepatic coma during the observation period. *In vivo*-activated lymphocytes were large cells with round- or bean-shaped nuclei and resembled blast cells after PHA stimulation. Since these lymphocytes did not form rosettes spontaneously with sheep RBC, it is likely that they were B-lymphocytes. *In vivo*-activated lymphocytes are considered to be a manifestation of an immune reaction occurring in chronic aggressive hepatitis.

6293 TREATMENT OF CHRONIC AGGRESSIVE HEPATITIS WITH D-PENICILLAMINE.

(Ger.) Heckers, H.; Gerhardt, H.; Leinweber, B.; Matthes, K. J. (Cent. Intern. Med., Univ. Gottingen, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:506-510, 1974.

D-penicillamine was used in the treatment of 32 patients, most of whom were hospitalized with chronic aggressive hepatitis and had been treated unsuccessfully with other drugs. Starting with 900 mg, the dosage was increased by 300 mg every 3 days so that a maximum of 1800 mg/day was reached in 13 days. This drug was combined with 300 mg/day of vitamin B_6 and was administered for as long as the blood picture permitted. Evaluation of histological findings in 14 patients who had been treated for as long as 20 months (mean 14 months) showed improvement in nine, no change in three, and deterioration in two. Of the latter two patients, one had cirrhosis and the other had a very active, chronic aggressive hepatitis which evolved into complete cirrhosis with portal decompensation within 4 months. At biopsy, three patients showed chronic persistent hepatitis and two had only residual periportal infiltrates; these two patients had been treated unsuccessfully for 4 and 2 yr, resp., with 75 to 100 mg/day of azathioprin, at times in combination with prednisolone. One seriously ill patient developed agranulocytosis in a 3-day period, but had a remission after D-penicillamine was discontinued and intensive antibiotic therapy was administered for 14 days. Another patient developed threatening leukopenia after 6 months of therapy, but was able to continue D-penicillamine when the dose was reduced to 600 mg/day. Some patients noted reversible changes in their sense of taste and others temporarily lost it. These disorders were traced by electrogustometry to areas innervated by the glosso-pharyngeal nerve; areas innervated by the facial nerve remained unaffected. Trials of copper salt substitution are planned for these patients. The results indicate the relatively high efficiency of D-pencillamine, and that intermittent leukopenia and granulocytopenia are not an absolute counterindication for this therapy.

6294 DIAGNOSTIC AND THERAPEUTIC ASPECTS OF CHRONIC AGGRESSIVE HEPATITIS.

(Ger.) Gronauer, G.; Mauersberger, H.; zu Dohna, P. (Villingen-Schwenningen Munic. Hosp., Germany). *Therapiewoche* 24(37):4001-4002, 1974.

In 12 patients with chronic aggressive hepatitis, confirmed by laparoscopy or liver biopsy, quantitative determination of immunoglobulins was useful in routine diagnosis. IgG values were generally increased the most, with smaller increases in IgA and IgM. If IgG concentrations were normal, only IgM concentrations were increased. Patients with antinuclear and anti-smooth-muscle antibodies were given azathioprin + prednisone (doses unspecified), while those in whom no organ-specific antibodies were detected received D-penicillamine and vitamin B_6 (doses unspecified). Patients were then followed for six months to six yr. Almost all of these patients had been unsuccessfully treated with prednisone alone. Distinct improvement or normalization of immunoglobulin fractions, transaminase activites, and liver size and consistency occurred in all cases. Clinical and laboratory findings normalized completely in one patient given azathioprin + prednisone, and no recurrence developed in a two-yr period. The results of treatment were better and improvement occurred more rapidly in patients given D-penicillamine and vitamin B_6. Two patients who were initially treated with azathioprin + prednisone and responded favorably had recurrences of hepatitis when they were given D-penicillamine and vitamin B_6 instead. Distinct improvement occurred a short time after these patients were again treated with azathioprin + prednisone. Treatment with D-penicillamine and vitamin B_6 was unsuccessful in a patient with chronic aggressive hepatitis and organ-specific antibodies. Normalization of transaminase values and in the liver size and consistency occurre shortly after a change to azathioprin and prednisone Therapy was consistently successful in the group of patients with chronic aggressive hepatitis and no organ-specific antibodies who were treated first with D-penicillamine and vitamin B_6.

6295 HEPATITIS-B ANTIGENAEMIA ASSOCIATED WITH ACTIVE CHRONIC HEPATITIS AND MESANGIOPROLIFERATIVE GLOMERULONEPHRITIS.

(E.) Stratta, P.; Camussi, G.; Ragni, R.; Vercellone, A. (Cattedra Nefol. Med., Univ. Turin, Italy). *Lancet* 2(7926): 179, 1975.

The occurrence of hepatitis-B antigenemia in a 33-yr old patient with active chronic hepatitis-associated mesangioproliferative glomerulonephritis is reported The patient was hospitalized with a 1-month history of increasing weakness, peripheral edema, and dark urine. His serum contained hepatitis-B surface antigen but not antibodies. Active chronic hepatitis wa diagnosed after examination of a liver biopsy specimen. Microhematuria, cylindruria, and unselective proteinuria were also found; and immunoglobulin G (IgG) was increased while serum-complement (C3 and C4) levels were below normal. Glomerular filtratio was 70 ml/min and urinary fibrin-degeneration products were seen. Light and electron microscopic examination of a percutaneous renal biopsy specimen showed mesangial deposits and proliferation; immunohistochemistry revealed segmentary subendothelial deposits of IgG and immunoglobulin M widespread and generalized mesangial immunoglobulin A deposits, positive segmentary subendothelial immunofluorescen of lqC and C4 complement deposits, and diffuse and generalized subendothelial mesangial deposits of C3 There was hepatitis-B antigen in the glomerular mesangium. The evidence suggested the involvement of a circulating immune complex in the pathogenesis of the disease. It is concluded that serum and glomerular hepatitis-B antigen should be sought in glomerulonephritis of all histological types.

6296 ELECTROPHORETIC INTRA-CUTANEOUS INTRODUCTION OF MAGNESIUM IN THE COMBINED TREATMENT OF CHRONIC LIVER DISEASE IN CHILDREN.

(Rus.) Ananeva, K. A.; Savelieva, L. A.; Nikolaeva, V. V.; Dedikova, L. A. (M. F. Vladimirskii Reg. Res. Inst. Clin. Med., Moscow, USSR). *Vopr. Okhr. Materin. De* 20(3):14-15, 1975.

6297 HEPATITIS AND CIRRHOSIS. *(Ger.)* Thaler, H. (Wilhelmine Hosp., Vienna, Austria). *Dtsch. Med. Wochenschr.* 100(18):1018-1025, 1975.

6298 THE IMMUNE PATHOGENESIS AND IMMUNODIAGNOSIS OF CHRONIC INFLAMMATORY LIVER DISEASES. *(Ger.)* Warnatz, H. (Univ. Hosp., Erlangen, Germany). *Med. Welt* 25(40):1592-1598, 1974.

6299 IMMUNE PROPHYLAXIS AND IMMUNOSUPPRESSION IN CHRONIC INFLAMMATORY LIVER DISEASE. *(Ger.)* Scheiffarth, F. (Univ. Hosp., Erlangen, Germany). *Med. Welt* 25(40):1589-1592, 1974.

6300 TREATMENT OF CHRONIC HEPATITIS AND CIRRHOSIS. *(Ger.)* Kommerell, B. (Med. Clin., Univ. Heidelberg, Germany). *Med. Welt* 25(46):1904-1910, 1974.

6301 DISTURBANCE OF LIPID METABOLISM IN PATIENTS WITH CHRONIC HEPATITIS AND LIVER CIRRHOSIS. *(Rus.)* Kurdybailo, F. V.; Mekhanik, Z. I. (Leningrad Sanit. Hyg. Med. Inst., USSR). *Klin. Med.* 53(1):64-67, 1975.

6302 TREATMENT OF CHRONIC HEPATITIS. *(Fr.)* Dioguardi, N. (Inst. Med. Pathol., Univ. Milan, Italy). *Cah. Med.* 15(10):663-667, 1974.

6303 CHRONIC VIRAL HEPATITIS. *(Fr.)* Darnis, F. (St. Antoine Hosp., Paris, France). *Cah. Med.* 15(15):1065-1070, 1974.

6304 THE DEVELOPMENT OF HEPATOMAS IN TWO PATIENTS WITH CHRONIC HEPATITIS AND HEPATITIS-ASSOCIATED ANTIGEN. *(Sp.)* Sotto, A.; Jimenez, G.; Ferret, O.; Oliva, J. (Inst. Gastroenterol, Havana, Cuba). *Rev. Esp. Enferm. Apar. Dig.* 45(3):317-324, 1975.

6305 CHRONIC HEPATITIS: NEW CLASSIFICATION AND CLINICAL CRITERIA. *(It.)* Del Prete, S.; Malacco, E.; Ucelli, S.; Doniach, D.; Dane, D. S.; Walsh, J. H. (Inst. Clin. Med. II, Univ. Milan, Italy). *Recent. Prog. Med. (Roma)* 56(3):193-211, 1974.

6306 CHANGES IN AUSTRALIA ANTIGEN (HB Ag) IN CHRONIC HEPATITIS BEFORE AND AFTER CORTICOSTEROID TREATMENT. *(It.)* Migneco, G.; Tripi, S.; Didato, A. (Inst. Gen. Clin. Med. Med. Ther., Univ. Palermo, Italy). *Boll. Soc. Ital. Biol. Sper.* 50(13):976-979, 1974.

6307 DIAGNOSIS AND THERAPY OF CHRONIC HEPATITIS. *(It.)* Messini, M. (Sch. Spec. Liver Dis., Univ. Rome, Italy). *Clin. Ter.* 71(6):505-520, 1974.

6308 THE EFFICACY OF TREATING PATIENTS WITH CHRONIC HEPATITIS AND HEPATOCHOLECYSTITIS BY MINERAL WATER AT ANKAVAN HEALTH RESORT. *(Rus.)* Ambartsumian, M. S.; Oganesian, D. A. (Ankavan Sanatorium, Armenia, USSR). *Vopr. Kurortol. Fizioter. Lech. Fiz. Kult.* (1):89-90, 1975.

6309 ALPHA$_1$-FETOPROTEIN IN CHRONIC HEPATITIS. *(It.)* De Benedetti, F.; Piombo, I. (Munic. Hosp., Genoa, Italy). *Minerva Gastroenterol.* 20(2):76, 1974.

6310 SERUM ARYLESTERASE ISOENZYMES IN CHRONIC HEPATITIS. *(E.)* Burlina, A.; Galzigna, L. (Gen. Hosp., Conegliano Veneto, Italy). *Clin. Biochem.* 7(3):202-205, 1975.

See also, 6097, 6101, 6127, 6168, 6187, 6238, 6243, 6244, 6245, 6249, 6272, 6273, 6277, 6338, 6523.

LIVER AND BILIARY TRACT

Alcoholic Liver Disease

6311 CONTRIBUTION TO ALCOHOLIC HEPATITIS. *(Ger.)* Stotzner, H. (Carl Gustav Carus Med. Acad., Dresden, Germany). *Zentrabl. Allg. Pathol.* 119(1/2):27-32, 1975.

Microscope examinations were performed on frozen and paraffin-embedded sections of punch liver biopsies taken from 64 patients (54 men and ten women, aged 26-69 yr) who had histories of drinking alcohol (mean 86 g/day) for long periods (mean 9.6 ± 5.2 yr) but who had no evidence of biliary disease or right heart failure or a history of exposure to hepatotoxic agents. Of these 64 patients, 30 (22 men and eight women) had alcoholic hepatitis. This was defined as neutrophilic granulocytes constituting: (1) about 1/3 of inflammatory cells in at least one affected portal field, (2) about 1/3 of inflammatory cells in one large intralobular focus of inflammation and (3) at least 1/2 of the cells in three or more small foci of inflammation. Hepatocytic necrosis was found in all 64 biopsies and the extent of this necrosis was not appreciably different in patients with alcoholic hepatitis and those without it. Of the 30 biopsies from patients with alcoholic hepatitis, all displayed steatosis; 15 had hydropic swelling, 19 had alcoholic hyalin, 17 had edema of the portal fields and 21 had bile duct proliferation. Two of these histological features were identified in seven patients; three were seen in 11 patients, four were seen in six patients and five were seen in six patients. No significant difference was found between the daily alcohol consumption or the duration of alcohol ingestion in patients with alcoholic hepatitis and those without it.

6312 IMMUNOLOGIC REACTIVITY AND ALCOHOLIC LIVER DISEASE. *(E.)* Zetterman, R. K.; Leevy, C. M. (Coll. Med. Dent. New Jersey, Newark). *Bull. NY Acad. Med.* 51(4):533-544, 1975.

The investigation of cell-mediated immunologic reactivity by means of lymphocyte transformation and the production of migration-inhibition-factor (MIF) improves the diagnosis and therapeutic perspective in the alcoholic with liver disease. Reduced lymphocyte reactivity to the mitogen phytohemagglutin (PHA) is frequently observed in malnourished alcoholics with liver disease. This can be attributed to a reversible disease in the synthetic capacity of DNA which occurs as a result of liver injury, nutritional deficiency, or circulating antagonists. It is suggested that immunologic hyperreactivity to alcoholic hyaline may be of crucial importance in the transformation of alcoholic hepatitis to cirrhosis. In spite of a decrease in the total number of T cells and reduced responsiveness to PHA, alcoholic hyaline evokes an increase in migration inhibition factor. Supernatants of sensitized lymphocytes, stimulated with this material, produce an increase in the incorporation of proline into collagen. It is suggested that this actin-like protein may serve as a neoantigen and may thus stimulate antibody-forming cells of T lymphocytes to release biologically active products. Immunologic competence, reflected in lymphocyte response to PHA, increases in the alcoholic, with improvement of hepatic reserve induced by abstinence and correction of nutritional deficiencies. Immunologic hyperactivity with release of migration-inhibition factor and fibrogenic factor persists despite progressive deterioration of the liver and eventually leads to a vicious cycle. It is felt that drugs which suppress immunologic response and reduce fibrogenesis may be useful therapeutic adjuncts in selected alcoholics with progressive hepatic-cell destruction despite abstinence from alcohol and a good diet.

6313 ABNORMAL RENAL ACIDIFICATION IN ALCOHOLIC LIVER DISEASE. *(E.)* Oster, J. R.; Hotchkiss, J. L.; Carbon, M.; Vaamonde, C. A. (Miami VA Hosp., Fla.). *J. Lab. Clin. Med.* 85(6):987-1000, 1975.

Studies were undertaken to better define the incidence and characteristics of acidification abnormalities in alcohol-induced liver disease and to demonstrate the practicality of using a calcium chloride ($CaCl_2$) acid-loading test of short duration in patients in whom ammonium chloride (NH_4Cl) might precipitate hepatic encephalopathy. After ingestion of 150 mEq $CaCl_2$, urinary acidification was studied for 6 hr in 22 normokalemic patients with alcoholic liver disease of varying severity and in 7 control subjects during 10 studies. The degree of the induced acidosis was similar in both groups. Of the liver disease patients, 9 were unable to normally lower urine pH below 5.25 and these were compared with the 13 patients achieving lower pH and with controls. This defect was consistently produced. Titratable acid excretion was less in the 9 patients than in the other groups. The percentage contribution of ammonium to maximal net acid excretion was significantly higher in all patients with liver disease than in controls. None of the group of 9 patients had spontaneous metabolic acidosis, nor was there evidence of encephalopathy or of proximal renal tubular dysfunction. Sodium excretion was significantly lower in the group of 9 patients than in either of the other two groups. Sodium sulfate and sodium phosphate infused after acid-loading rapidly reduced urine pH into the appropriately acidic range in the 9 patients. Incomplete distal renal tubular acidosis was thus delineated in 41% of the patients with alcoholic liver disease by means of a simple, safe, and short acid-loading test. Although the mechanism of this renal tubular acidifying defect remains unknown, a low distal delivery of sodium may have been partially responsible by limiting the transtubular potential difference.

6314 CELL-MEDIATED IMMUNITY TO LIVER IN PATIENTS WITH ALCOHOLIC HEPATITIS. *(E.)* Mihas, A. A.; Bull, D. M.; Davidson, C. S. (Boston City Hosp., Mass.). *Lancet* 1(7913):951-953, 1975.

The possibility that cell-mediated immunity to liver tissue is altered in alcoholic hepatitis was studied. Mononuclear cell responses to liver extracts were studied by a migration-inhibition assay in 24 patients with alcoholic liver disease (15 with acute alcoholic hepatitis and 9 with 'stable' Laennec's cirrhosis); 8 with viral hepatitis; 11 chronic alcoholics without evidence of liver disease; and in 15 healthy controls. Patients with acute alcoholic hepatitis demonstrated liver-antigen-induced inhibition of migration (migration index, 0.58), while patients with cirrhosis, alcoholism, and acute viral hepatitis, as well as controls, did not demonstrate such a response (migration indices, 0.92, 0.90, 0.86, and 0.99, resp.). It is concluded that cell-mediated immunity to normal or damaged liver tissue may act to perpetuate alcoholic hepatitis and thereby contribute to the development of cirrhosis.

6315 CHANGES IN THE RATE OF ALCOHOL CATABOLISM INDUCED BY PHENOBARBITAL, CHRONIC ALCOHOLISM, AND FASTING IN MAN. *(Ger.)* Bode, J. C.; Bode, C.; Thiele, D. (Med. Clin., Univ. Marburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:484-487, 1974.

The effect of long fasts (36 hr) and fructose on blood alcohol levels was studied in normal subjects whose average daily alcohol consumption was less than 20 g. Controls were given infusions of 0.5 g/kg alcohol over a 45-min period and, after a 30-min equilibration period, blood samples were taken at 20 min intervals for 1 hr to determine alcohol concentrations. The rate at which blood alcohol levels decreased was 20-60% slower after a 36-hr than after a 12-hr fast. Infusions of fructose (0.8 g/kg/hr), given 2 hr after alcohol, stimulated decreases in blood alcohol levels of an average of 48% after a 12-hr fast and of 125% after a 36-hr fast. These findings suggest that decreased reoxidation of cytoplasmic NADH, rather than decreased alcohol dehydrogenase activity, is responsible for inhibiting alcohol oxidation. Administration of phenobarbital (300 mg/kg/day) for 6 days to these controls increased the rate of alcohol oxidation by an average of 51%, but values decreased significantly 2-3 days after discontinuation of the phenobarbital. This could be interpreted as indirect evidence for the existence of an alcohol-inducible microsomal ethanol-oxidizing system, but fructose-induced stimulation of alcohol oxidation was not significantly affected by administration of phenobarbital. This suggests that phenobarbital increases alcohol oxidation by a mechanism similar to that of fructose (increased NADH reoxidation). Studies performed on 13 alcoholic inpatients (average daily alcohol consumption of more than 100 g) showed that alcoholics metabolized alcohol more rapidly than controls (3.15 *versus* 2.51 mM/l). Values which were significantly above the normal range were found in only four of the 13 alcoholics who had abstained less than ten days. Fructose infusions caused little or no stimulation of alcohol oxidation in these four patients. This suggests that metabolic changes in the livers of chronic alcoholics cause an increase in the rate of alcohol metabolism *via* accelerated reoxidation of NADH.

6316 INHIBITORS OF LEUKOCYTE CHEMOTAXIS IN ALCOHOLIC LIVER DISEASE.

(E.) Van Epps, D. E.; Strickland, R. G.; Williams, R. C., Jr. (Univ. New Mexico, Sch. Med., Albuquerque, N. M.). *Am. J. Med.* 59(2):200-207, 1975.

The characteristics of serum chemotactic inhibitory activity were determined and its relation to alcoholic liver disease and infection was examined in a study of 42 patients (37 men and 5 women, aged 23-68 yr) with alcoholic liver disease. Chemotaxis experiments were performed by the Boyden technique and chemotaxis was determined visually by counting the average number of cells migrating through the membrane per high power field for polymorphonuclear leukocytes or cells per oil immersion field for monocytes. The patients were also tested for lymphocytotoxic antibodies, relative proportions or absolute numbers of peripheral blood T and B lymphocytes, and serum immunoglobulin levels. Twenty-one patients showed serum chemotactic inhibitory activity. It was not related to any single biochemical or histologic feature in the patients studied. The frequency of chemotactic inhibitory activity was greatest in those with active infection. Serial studies demonstrated that chemotactic inhibitory activity may be a transient phenomenon, associated with active alcoholic liver disease or appearance of infection. Nine of 15 patients showed skin test anergy; chemotactic inhibitory activity was present in eight of these nine patients. Serum immunoglobulin A (IgA) and G (IgG) concentrations were significantly higher in patients with chemotactic inhibitory activity. Sucrose density gradient centrifugation of serums showing chemotactic inhibitory activity yielded three peaks of inhibitory activity: two had sedimentation coefficients of 10.7S and 6.8S, and the third was approximately 3S. The two higher molecular weight inhibitors were predominant in the 50% ammonium sulfate precipitate. Immunoabsorption by anti-IgA but not by anti-IgG or IgM columns removed the ammonium sulfate precipitable chemotactic inhibitors. The appearance of chemotactic inhibitors in patients with alcoholic liver disease may have relevance to their apparent susceptibility to serious infections.

6317 PLASMA LEVELS AND EXCRETION OF ESTROGENS IN URINE IN CHRONIC LIVER DISEASE.

(E.) Pentikainen, P. J.; Pentikainen, L. A.; Azarnoff, D. L.; Dujovne, C. A. (Univ. Kansas Med. Cent., Kansas City, Kan.). *Gastroenterology* 69(1):20-27, 1975.

Plasma levels of nonconjugated esterone (E1), estradiol-17β (E2), and estriol (E3) and excretion of these estrogens in urine in conjugated and nonconjugated forms were measured by radioimmunoassay in 17 healthy males and 33 males with alcoholic liver disease. Total estrogens in urine were estimated after hydrolysis of the glucuronide and sulfate conjugates in hot acid. All samples were assayed in duplicate. Patients with liver disease had significantly elevated plasma levels of E1 (74.2 ± 8.0 SE *versus* 26.0 ± 1.7 pg/ml, $P < 0.001$), E2 (29.3 ± 2.2 *versus* 23.3 ± 2.0 pg/ml, $P = < 0.05$), and E3 (11.5 ± 1.9 *versus* 6.5 ± 0.7 pg/ml, $P < 0.01$). Excretion of total E1, E2, and E3 in urine was significantly increased in patients with liver disease. The increase was primarily in the nonconjugated fraction. Among those patients with chronic liver disease, the presence of ascites was associated with significantly higher plasma levels of E1 and excretion of larger amounts of E1 and E2 in urine. No differences were observed in the small number of patients with gynecomastia. The changes in plasma and urinary E1 and E2 values correlated directly with several liver function abnormalities, in particular with abnormal values for prothrombin time and plasma albumin levels. The increased plasma levels as well as the increased excretion of E1, E2, and E3 in urine observed in these patients are compatible with the explanation that they result from an increased rate of peripheral conversion of androgens.

6318 ALCOHOL AND DIETARY FACTORS IN CIRRHOSIS. AN EPIDEMIOLOGICAL STUDY OF 304 ALCOHOLIC PATIENTS.

(E.) Patek, A. J., Jr.; Toth, I. G.; Saunders, M. G.; Castro, G. A. M.; Engel, J. J. (VA Hosp., Boston, Mass.). *Arch. Intern. Med.* 135(8): 1053-1057, 1975.

Alcohol intakes and dietary habits of 304 alcoholic, hospitalized patients were evaluated to determine whether differences exist in the drinking habits and dietary backgrounds of alcoholic patients with and without cirrhosis. Histories of alcohol intake were obtained using standard questionnaires. Dietary histories over a 2-yr period were based on the recall method using a questionnaire for inquiry into ten food categories. There were 195 patients with hepatic cirrhosis, 40 precirrhotics and 69 noncirrhotics. In 85% to 94% of patients, excessive drinking began before the age of 30. Noncirrhotics were prone to drink less straight spirits than the other two groups combined, but the differences were not significant. More precirrhotics drank only spirits than did cirrhotics. Mean total daily calories ranged from 3200 to 3500, alcohol contributing 51% to 58%. The noncirrhotic group had a 13% higher intake of protein than the cirrhotic group and a 13% higher intake from other food sources. The precirrhotic groups was small, and the standard errors of its mean intakes were large so that it did not differ significantly from the other groups on statistical analysis. A familial incidence of alcoholism occurred in 60% of cirrhotics and in 58% of noncirrhotic alcoholics. The findings suggest that dietary factors may be involved in the pathogenesis of the disease.

6319 ZIEVE'S SYNDROME WITH CUTANEOUS MANIFESTATIONS. *(Fr.)* Heid, E.; Samsoeu, M.; Reuter, G.; Grosshans, E.; Busset, A. (Munic. Hosp. Strasbourg, France). *Ann. Dermatol. Syphiligr. (Paris)* 81(5):486-488, 1974.

6320 THE DIAGNOSTIC AND PROGNOSTIC VALUE OF THE IgA:TRANSFERRIN RATIO IN ALCOHOLIC CIRRHOSIS. *(Fr.)* Paris, J.; Jaillard, J.; Paris, J. C.; Sezille, G.; Fruchart, J. C.; Voiment, Y. M. (no affil.). *Lille Med.* 19(10):1002-1006, 1974.

6321 EVALUATIVE COMMENT ON THE RISK AND SAFETY OF AN ALIMENTARY SUBSTANCE: ALCOHOL. *(Fr.)* Tremolieres, J. (Lab. Biol. Natl. Conserv. Arts Sci., Paris, France). *Ann. Nutr. Aliment.* 28(4):317-334, 1974.

6322 SURGICAL CONSEQUENCES OF ALCOHOLISM. *(E.)* Orloff, M. J. (Dep. Surg., Univ. Calif., La Jolla). *Ann. N.Y. Acad. Sci.* 252:159-169, 1975.

6323 CURRENT POLICIES IN HEPATIC TRANSPLANTATION: CANDIDACY OF PATIENTS WITH ALCOHOLIC LIVER DISEASE OR PREFORMED ANTIDONOR ANTIBODIES AND A REAPPRAISAL OF BILIARY DUCT RECONSTRUCTION. *(E.)* Starzl, T. E.; Putnam, C. W.; Ishikawa, M.; Picacho, R.; Husberg, B.; Halgrimson, C. G.; Schroter, G. (Univ. Colorado Med. Cent., Denver). *Ann. N.Y. Acad. Sci.* 252:145-158, 1975.

6324 THE SKIN IN DIAGNOSIS OF ALCOHOLISM. *(E.)* Woeber, K. (Med. Fac., Univ. Bonn, West Germany). *Ann. N.Y. Acad. Sci.* 252:292-295, 1975.

6325 NEWER APPROACHES TO TREATMENT OF LIVER DISEASE IN THE ALCOHOLIC. *(E.)* Leevy, C. M.; Zetterman, R.; Smith, F. (New Jersey Med. Sch., Newark). *Ann. N.Y. Acad. Sci.* 252:135-144, 1975.

6326 CIRRHOSIS IN THE ALCOHOLIC AND ITS RELATION TO THE VOLUME OF ALCOHOL ABUSE. *(E.)* Lelbach, W. K. (Dep. Int. Med., Univ. Clin. Bonn, West Germany). *Ann. N.Y. Acad. Sci.* 252:85-105, 1975.

6327 LIVER DISEASE AND ALCOHOL: FATTY LIVER, ALCOHOLIC HEPATITIS, CIRRHOSIS, AND THEIR INTERRELATIONSHIPS. *(E.)* Lieber, C. S. (VA Hosp., Bronx, New York). *Ann. N.Y. Acad. Sci.* 252:63-84, 1975.

6328 ALCOHOLIC HEPATITIS, CIRRHOSIS, AND IMMUNOLOGIC REACTIVITY. *(E.)* Leevy, C. M.; Chen, T.; Zetterman, R. (New Jersey Med. Sch., Newark). *Ann. N.Y. Acad. Sci.* 252:106-115, 1975.

6329 THE ROLE OF ALCOHOLISM IN HEPATIC IRON STORAGE DISEASE. *(E.)* Powell, L. W. (Dep. Med., Univ. Queensland, Australia). *Ann. N.Y. Acad. Sci.* 252:124-134, 1975.

6330 THE PROTEIN BINDING OF SOME DRUGS IN PLASMA FROM PATIENTS WITH ALCOHOLIC LIVER DISEASE. *(E.)* Affrime, M.; Reidenberg, M. M. (Temple Univ. Sch. Med., Philadelphia, Pa.). *Eur. J. Clin. Pharmacol.* 8(3/4):267-269, 1975.

6331 THE SPECTRUM OF LIVER DISEASE IN ALCOHOLISM. *(E.)* Bhathal, P. S.; Wilkinson, P.; Clifton, S.; Rankin, J. G.; Santamaria, J. N. (St. Vincent's Hosp., Melbourne, Australia). *Aust. N.Z. J. Med.* 5(1):49-57, 1975.

6332 IMPAIRED DEFENSE MECHANISMS ASSOCIATED WITH ACUTE ALCOHOLISM. *(E.)* Johnson, Jr., W. D. (Cornell Univ. Med. Coll., New York, N.Y.). *Ann. N.Y. Acad. Sci.* 252:343-347, 1975.

See also, 5423, 6052, 6097, 6366.

Cirrhosis

6333 CHILDHOOD CIRRHOSIS ASSOCIATED WITH ALPHA-1-ANTITRYPSIN DEFICIENCY. A GENETIC, BIOCHEMICAL, AND MORPHOLOGIC STUDY. *(E.)* Asarian, J.; Archibald, R. W. R.; Lieberman, J. (Stanford Med. Cent., Calif.). *J. Pediatr.* 86(6):844-850, 1975.

Clinical and pathological data on a fatal case of juvenile cirrhosis due to homozygous α_1-antitrypsin deficiency followed over a 6-yr period, and comparisons of the phenotypic and biochemical findings in 27 relatives of the three-generation pedigree, are presented. At age 2 yr, 4 months, the proband (a girl) was hospitalized for evaluation of ascites. The liver and spleen were enlarged 3 cm below the costal margin. Serum transaminase, alkaline phosphatase, and LDH values were moderately elevated. Cholesterol concentration and serum ceruloplasmin were increased. At exploratory laparotomy the diffusely enlarged, firm nodular liver was biopsied: advanced cirrhosis of undetermined etiology was shown. Hepatosplenomegaly increased and a mild hyperbilirubinemia developed over the next 2 yr. By age 5 yr, examination showed spider angiomata, ascites, and a prominent venous pattern, with hepatosplenomegaly. At age 7 yr, 6 months she developed steatorrhea and massive ascites. Serum α_1-antitrypsin was less than 50 mg/dl, and a diagnosis of cirrhosis due to severe α_1-antitrypsin deficiency was made. She died at 8 yr, 5 months, of hepatic encephalopathy. A study of 27 relatives of the proband revealed 15 with heterozygous MZ phenotypes. Levels of circulating α_1-antitrypsin and trypsin-inhibiting capacity were shown to be unreliable in identifying the heterozygous state, protease inhibitor typing being necessary for definitive diagnosis. The morphologic evolution of the hepatic changes in this condition were studied, and the importance of the periodic acid-Schiff stain in identification of the characteristic cytoplasmic bodies is stressed.

6334 SODIUM SULFOBROMOPHTHALEIN KINETICS IN CIRRHOSIS OF THE LIVER BEFORE AND AFTER PORTACAVAL SHUNT. *(E.)* Cartel, G.; Benedetti, G.; Spine, G. P. (Dep. Surg. Pathol., Univ. Padua, Italy). *Am. J. Surg.* 130(7):47-50, 1975.

BSP kinetics in 36 patients (aged 17-65 yr) with liver cirrhosis and portal hypertension were investigated before and after portacaval shunt by the method of Barber-Riley *et al.* Side-to-side portacaval antastomosis was performed in 18 cases, end-to-side in 2, and splenorenal in the remaining 2 of the 22 patients who underwent operation. After i.v. injection of 5 mg/kg BSP, blood samples were taken from the opposite arm every 3 min for 20 min and thereafter every 5 min during the 30-120 min postinjection. In the 36 patients the percentage retention of BSP at 45 min was 29.95 ± 2.08; there was no overlap with the values for 39 healthy controls, in whom the upper limit of percentage retention was 3%. Preoperative BSP transfer rates, calculated from the plasma disappearance curves, differed significantly from control rates. Liver uptake of BSP and its transfer from liver to bile were grossly reduced and its transfer from liver back to plasma was augmented. In 15 patients 1 month after shunt, the liver uptake of BSP was 29.6% lower than preoperative values, whereas the transfer rate of BSP from liver to bile was unchanged. In 7 patients 1 yr after operation, the liver uptake of BSP was 28.3% lower and the transfer of BSP from liver to bile 29.9% lower than preoperative values. Further significant increases in BSP retention percentage occurred at 1 month and 1 yr. These results show that the increased percentage retention of BSP in patients with liver cirrhosis is accompanied by decreases in liver uptake of BSP and in transfer of BSP from liver to bile; transfer of BSP from liver to plasma is increased. One yr after operation, the deterioration of liver uptake of BSP ceases, while transfer of dye from liver to bile slightly deteriorates. Whether this deterioration is due to the operation or to a spontaneous evolution of cirrhosis could not be determined.

6335 EFFECT OF ORNITHINE ALPHA OXOGLUTARATE ON BRAIN METABOLISM IN PATIENTS WITH CHRONIC LIVER DISEASE. *(E.)* James, I. M.; Hamlyn, A. N.; Brant, P. C.; Hildrew, P. (R. Free Hosp., London, England). *J. Neurol. Neurosurg. Psychiatry* 38(3): 214-218, 1975.

The effect of ornithine α-oxoglutarate infusion on brain metabolism in 6 patients (4 men and 2 women, aged 24-70 yr) with chronic liver disease was studied with particular attention to glucose utilization. The patients had portal vein thrombosis (1); alcoholic cirrhosis (2); cryptogenic cirrhosis (2); and primary biliary cirrhosis (1). All exhibited only minimal neurological signs. Brain oxygen and glucose consumption were studied before and after i.v. infusion of ornithine α-oxoglutarate over a 15-min period. A further patient admitted in deep coma was also studied before and after 4-hr infusion with 60 g ornithine α-glutarate. Initial cerebral blood flow values ranged from 38-79 ml/100 g/min. There was no overall change in cerebral blood flow after infusion, but individually some changes were fairly substantial. Changes in $PaCO_2$ did not appear to have been the reason for these flow changes. Cerebral oxygen consumption increased significantly in 4 of the 6 patients, while cerebral glucose consumption decreased significantly in 5. After infusion in the patient with coma, cerebral blood flow and oxygen consumption increased and glucose consumption fell. These data confirm the finding of anaerobic glycolysis in patients with hepatic encephalopathy. In these patients, the biochemical disturbance of anaerobic glycolysis can be at least partially reversed with α-oxoglutarate administration, but the mechanism by which these changes are effected remains in doubt.

6336 COMPLICATIONS IN THE TREATMENT OF BLEEDING FROM ESOPHAGEAL VARICES WITH BALLOON TUBES. *(Ger.)* Brunswig, D.; Spech, H. J.; Heine, W. D. (Med. Clin., Univ. Wurzburg, Germany). *Therapiewoche* 24(39):4261-4262, 4264, 4267, 1974.

In comparison with the mortality (57%) resulting from bleeding esophageal varices in cirrhotics, severe, unavoidable complications associated with balloon tamponade are negligible. The most common complications are esophageal rupture, penetrating pressure ulcers, and aspiration during intubation. Fatal complications appear to be less frequent and bleeding is more often controlled when the Linton-Nachlas, rather than the Sengstaken-Blakemore, tube is used. Prospective studies are needed to determine whether selective, intra-arterial infusions of vasopressin are superior to balloon tamponade, particularly when extensive varices of the fundus are present. Although many complications can be avoided by the use of proper technique, trained personnel and intensive care are required to recognize and prevent untoward effects of tamponade. While tamponade can be a life-saving emergency measure in the treatment of bleeding esophageal varices, patients should be carefully evaluated for portacaval shunt surgery.

6337 PERIOD-AMPLITUDE ANALYSIS OF THE ELECTROENCEPHALOGRAM CORRELATED WITH LIVER FUNCTION IN PATIENTS WITH CIRRHOSIS OF THE LIVER. *(E.)*

Kardel, T.; Stigsby, B. (Gentofte Hosp., Univ. Copenhagen, Denmark). *Electroencephalograph. Clin. Neurophysiol.* 38(6):605-609, 1975.

Studies of the activity distribution of the electroencephalogram (EEG) by period-amplitude analysis were made in 40 patients with liver cirrhosis, with or without a surgical portacaval anastomosis, and in 25 controls. From the two parieto-occipital leads, 100 sec of EEG were examined. A quantitative determination of liver function was made in the patients by the galactose elimination capacity. A gradual slowing of the EEG was observed when passing from controls to nonshunted cirrhotics and shunted cirrhotics. This was reflected by significant differences in the amount of activity in some of the frequency bands and by a decrease of the dominant EEG frequency. There was a statistically significant, although weak, positive correlation between the dominant EEG frequency and the galactose elimination capacity in the non-shunted patients and in both patient groups considered together; the correlation was not significant in the shunted patients considered alone. A similar shift to lower EEG frequencies was previously observed in patients with chronic renal failure. Thus, it is concluded that the slowing of the EEG in patients with cirrhosis of the liver is an unspecific expression of metabolic brain disturbance.

6338 CHANGES IN PLASMA VISCOSITY IN CHRONIC LIVER DISEASE. *(Ger.)*

Palme, G.; Kochen, M.; Leonhardt, H. (Steglitz Clin., Free Univ., Berlin, Germany). *Clin. Chim. Acta* 61(2):163-169, 1975.

Measurements of plasma viscosity were performed on fasting blood samples from 37 patients (20 men and 17 women, mean age 56 yr) with chronic hepatitis (six cases), chronic hepatitis evolving into cirrhosis (seven cases), active cirrhosis (six cases), and inactive cirrhosis (17 cases). Portal hypertension was diagnosed in 25 cases and esophageal varices in seven. On the basis of these findings, patients were classified into three groups. Decreased viscosity was found in patients with cirrhosis, severe portal hypertension, and esophageal varices. Viscosity was normal in patients with inactive cirrhosis without portal hypertension. Patients with active cirrhosis and chronic progressive hepatitis had increased viscosity. Increased plasma viscosity was associated with increased concentrations of IgG, while decreased viscosity was associated with low fibrinogen levels. Close correlations were also found between plasma viscosity and the activities of SGOT, SGPT, and GLDH. When 5 patients with chronic progressive hepatitis and increased IgG concentrations were treated with corticosteroids, the plasma and whole-blood viscosities decreased to normal values with a parallel decrease in SGOT activity as a manifestation of restored hepatocellular integrity and an improvement in the normotest (factors II, VII and X) as a manifestation of improved synthesis of liver-specific clotting factors. Further research is needed to determine whether blood viscosity values can be used as an indication for corticosteroid therapy in chronic liver disease.

6339 ALCOHOL AND LIVER CIRRHOSIS-A QUANTITATIVE PROBLEM? *(Ger.)*

Leibach, W. K. (Med. Clin., Univ. Bonn, Germany). *Therapiewoche* 24(51): 6025-6032, 1974.

The author's experience with a group of 526 male alcoholics, treated for 6 months as inpatients, showed that it was easier to ascertain the duration of alcohol abuse than to establish the daily consumption. The mean duration of alcohol abuse was 9.1 yr, but only 417 patients gave reliable information on their daily consumption; 186 (45%) reported amounts of 160 g or less, while 231 (55%) reported amounts above 160 g. The mean for the entire group was 180 g/day. On the basis of biopsy findings in 320 cases and clear-cut clinical diagnoses of cirrhosis in 14, patients were divided into four groups according to the duration of alcohol abuse. Since the daily consumption increased with increasing duration of abuse, the effect of these two factors could not be evaluated separately. Consequently, 216 patients with identical durations of abuse (about 8 yr) were subdivided into two groups with different daily consumptions. The age distribution and body weights were identical in these two groups. In patients consuming more than 160 g/day (mean 227 g), only 10% had completely normal histological findings, and precirrhotic changes were twice as common (33% *versus* 14%) as in patients consuming less than 160 g/day. While none of the patients in the second group had cirrhosis, cirrhosis was diagnosed in 14% of those consuming more than 160 g/day. Thus, the risk of developing alcoholic cirrhosis depends upon both the duration of alcohol abuse and the amount of alcohol consumed/day. In a group of 265 biopsied alcoholics, the average daily consumption was related to body weight and time in hours, and this was plotted against the extent of histological change. The resulting curve was almost a straight line. In this group of 265 biopsied alcoholics, the product of dose/kg body weight and the duration of abuse was calculated for each patient and ranked into 13 classes, and the incidence of cirrhosis and precirrhotic changes was determined for each class. Regression analysis demonstrated a highly significant correlation between the total dose of alcohol consumed/kg and the incidence of both cirrhosis and liver damage more severe than uncomplicated fatty liver.

6340 INSORPTION OF TRITIATED WATER IN CIRRHOSIS. *(Ger.)* Mertz, D. P.; Weiss, M. (Med. Polyclin., Univ. Freiburg, Germany). *Res. Exp. Med. (Berl.)* 165(1):9-18, 1975.

The insorption of tritiated water and its distribution volumes were studied in ten patients with cirrhosis (seven men and three women, aged 37-66 yr) and five normal controls after p.o. administration of 200 µCi of THO in an average of 100 ml water. Cirrhosis was alcoholic in etiology in four cases and was associated with mild diabetes mellitus in three cases and with hemochromatosis in one. Both blood and urine samples were taken before and blood samples were taken at 10-min intervals until 2 hr after the administration of THO. Then blood and urine samples were taken at hourly intervals between 3 and 24 hr after administration of THO. The time required for THO to reach its maximum concentration in the blood varied greatly (from 30-110 min) in cirrhotics and was not related to the volume of total body water or to the etiology of the cirrhosis. Although the time required to reach maximum THO concentrations was normal in three cirrhotics, it was significantly longer (mean 69.0 min) in cirrhotics than in controls (37.0 min). The volume of total body water related to weight was significantly greater (59.8%) in cirrhotics than in controls (52.8%). For the first 20 min after administration of THO, the rate at which THO was insorbed was the same in cirrhotics and controls. Values for this rate were significantly greater in cirrhotics after 40, 50, and 70 min. Although changes in fluid balance cannot be ruled out as a cause of slower insorption of THO in cirrhotics, it is suggested that changes in intestinal blood flow, tissue pressure, and colloid-osmotic pressure contribute to this abnormality.

6341 THE SYSTEMIC CIRCULATION IN PORTAL HYPERTENSION. *(Ger.)* Liehr, H.; Grun, M.; Thiel, H. (Med. Clin., Univ. Wurzburg, Germany). *Z. Gastroenterol.* 13:133-146, 1975.

Experimental and clinical studies were performed to determine whether the development of hyperdynamic circulation and disorders in volume regulation is a process associated with portacaval collaterals or with cirrhosis, and whether circulatory changes occurring in cirrhosis represent a mechanism compensating for changes in portal blood flow. In rats in which portal hypertension was gradually induced by occlusion of the portal vein with Ameroid rings, the cardiac output increased to a mean of 36.9 ml/min/100 g (control value was 6.3 ml/min), and the circulation time decreased to 2.8 sec (control value was 3.6 sec) with increasing shunt volume (64%). The blood volume was 7.5 ml/100 g in comparison with 6.3 ml/100 g for controls. These changes regressed with a decrease in the portacaval shunt volume caused by the formation of portahepatic anastomoses. Comparable values were obtained in rats with portacaval anastomoses 28 days after surgery. In 77 patients with cirrhosis, the cardiac output was 3.3 $l/min/m^2$ for those with few collaterals and 4.1 $l/min/m^2$ for those with pronounced collaterals. Similarly, a significant difference was found between the arm-ear time in patients with few collaterals (12.6 sec) and those with pronounced collaterals (10.2 sec). The blood volume increased significantly (from 74.2 ml/kg to 36.0 ml/kg) as the extent of portacaval collaterals increased. The ratio of blood flow to liver mass remained normal (shunt volume 64%), or decreased to 75% of the normal values (shunt volume 100%), as a result of increased cardiac output. It is concluded that hyperdynamic circulation and hypervolemia are only associated with a hemodynamically relevant portacaval collateral circulation and are independent of cirrhosis. These conditions develop independent of the portal pressure and can be considered to compensate for decreases in portal blood flow.

6342 VALUES OF LARGE DOSES OF PREDNISOLONE IN THE TREATMENT OF HEPATIC COMA IN CIRRHOTICS FOLLOWING SHUNT SURGERY. *(Ger.)* Paquet, K. J.; Figge, H.; Welte, D. (Surg. Clin., Univ. Bonn, Germany). *Therapiewoche* 24(42):4817-4820, 4823-4826, 1974.

Large doses of prednisolone were administered over a short period to 26 patients who developed any of the following indications after shunt surgery: (1) liver coma, no matter what the cause, (2) acute exacerbation of cirrhosis, or (3) increased fibrinolysis or disseminated intravascular clotting. In addition, prednisolone was given to patients with small livers and adequate functional reserves who required end-to-side portacaval shunts and to patients with decompensated liver function who underwent emergency surgery. Of these 26 patients, 16 had portacaval shunts and 10, distal splenorenal shunts; six underwent emergency surgery. Prednisolone was administered in doses of 100 mg/24 hr on days 1-4 postoperatively; 50 mg/24 hr on days 5-6; 100-300 mg/24 hr on days 7-8; and 10-100 mg/24 hr on days 9-14. Controls consisted of 50 patients who underwent shunt surgery and who, for the most part, developed no postoperative complications. Of the 26 prednisolone-treated patients, five died: the cause of death was liver coma with recurrent bleeding (2 cases), liver coma without recurrent bleeding (1), subphrenic abscess, local peritonitis, and septicopyemia following splenorenal shunt surgery (1), and pneumonia and heart failure (1). Among patients given large doses of prednisolone, SGOT and SGPT values which were significantly increased immediately after surgery normalized within 14-21 days; similar data were not available from the control group. The increase in bilirubin levels which occurred in the first two days after surgery was significantly higher among prednisolone-treated patients than among controls. Normalization of total protein and cholinesterase levels and clotting factors occurred within 10-14 days in prednisolone-treated patients. None of the prednisolone-treated patients developed side effects. Although these findings suggest that large doses of prednisolone may prevent liver coma from developing after shunt surgery, no definitive conclusions can be drawn because of the small number of patients treated and because of the many other therapeutic measures utilized to prevent liver failure (e.g., bed rest, high-carbohydrate diet, gastric suction, maintenance of fluid and electrolyte and acid-base balance, administration of antibiotics, albumin, plasma substitutes, aldosterone antagonists, lactulose).

6343 INCREASED FIBRINOGEN SYNTHESIS IN PORTAL HYPERTENSION.

(Ger.) Grun, M.; Liehr, H.; Thiel, H.; Brunswig, D.; Buchenau, D. (Med. Clin., Univ. Wurzburg, Germany). *Z. Gastroenterol.* 12(suppl.):409-410, 1974.

Portal hypertension, portacaval anastomoses, hypoxic atrophy of the liver, and hypervolemia with hypercirculatory syndrome were induced in rats by placing rings of expandable material around the portal vein. Six days after surgery the plasma fibrinogen level was still normal, but the mean blood volume had increased to 148% of control values, the plasma fibrogen pool to 154% of control values, and the rate of incorporation of ^{14}C-leucine into thrombin-precipitated plasma protein/g liver to 211% of control values. During normalization of the plasma volume by formation of portohepatic anastomoses (21 days after surgery), the rate at which ^{14}C-leucine was incorporated into thrombin-precipitated plasma protein decreased to 61% of the control values. Similar studies were performed on 28 patients with cirrhosis who were divided into three groups, depending upon the extent to which portacaval anastomoses had developed. In the group as a whole, plasma volume was increased. There was a positive correlation between this increase and the extent of the portacaval shunt volume. The hepatic volume decreased with increasing portacaval shunt volumes. Since the mean plasma fibrinogen level for the entire group was 223 ± 72 mg/100 ml, the plasma fibrinogen pool was increased to 8.23 ± 2.49 g. However, the extent of this increase differed in each of the three groups and was not related to hepatic volume. Thus, in both experimental animals and patients with cirrhosis the plasma fibrinogen pool is increased despite a decrease in the hepatic volume, suggesting that the rate of fibrinogen synthesis is increased. Therefore, the plasma fibrinogen pool is apparently regulated by the plasma fibrinogen level, even under pathological conditions.

6344 PIGMENTED CORNEAL RINGS IN A PATIENT WITH PRIMARY BILIARY CIRRHOSIS.

(E.) Fleming, C. R.; Dickson, E. R.; Hollenhorst, R. W.; Goldstein, N. P.; McCall, J. T.; Baggenstross, A. H. (Mayo Clin. Mayo Found., Rochester, Minn.). *Gastroenterology* 69(1):220-225, 1975.

A case report of a 54-yr-old woman with primary biliary cirrhosis in whom corneal rings similar to Kayser-Fleischer rings were detected by slit-lamp biomicroscopy is presented. Jaundiced serum was first noted in 1966. In 1969 a percutaneous needle biopsy of the liver showed marked inflammation of portal tracts with severe piecemeal necrosis, marked periportal and septal fibrosis, and a decrease in the number of interlobular bile ducts. The patient was treated with cholestyramine and fat-soluble vitamins. In September 1973 excretory urography confirmed a radioopaque renal stone, and the urine oxalate excretion was 60 mg/24 hr (normal <25 mg/24 hr). In May 1974 the patient showed high levels of serum ceruloplasmin, 97 mg/dl and repeated 88 mg/dl (normal 22.9-43.1); serum copper, 279 μg/dl (normal 75-145); urinary copper excretion, 221 μg (normal 15-49); and hepatic copper concentrations, 756 μg/g of dry weight of liver (normal 15-35). Needle biopsy of the liver revealed the cirrhotic stage of primary biliary cirrhosis with reduction in interlobular bile ducts and moderate atypical ductular proliferation. Results of ophthalmological examination were normal except for severe scleral icterus and 1.5-mm wide band of yellowish green pigmentation that extended around the entire periphery of each cornea and in the region of Descemet's membrane. The ring was denser peripherally and faded to normal cornea away from the limbus. The color and location of the pigment were like those of Kayser-Fleischer rings, but were of lesser density than is usual in patients with advanced Wilson's disease. Kayser-Fleischer rings, similar to those seen in this patient with primary biliary cirrhosis, have been observed in patients with early or minimal manifestations of Wilson's disease. Wilson's disease was excluded on the basis of the elevated serum ceruloplasmin and copper levels, the lack of neurological disease despite advanced liver disease, a negative family history and the typical clinical features of primary biliary cirrhosis. The patient was treated with a low-sodium diet, diuretics, cholestyramine and vitamin K.

6345 EFFECT OF LIVER FAILURE ON THE RESPONSE OF VENTILATION AND CEREBRAL CIRCULATION TO CARBON DIOXIDE IN MAN AND IN THE GOAT.

(E.) Stanley, N. N.; Salisbury, B. G.; McHenry, L. C., Jr.; Cherniack, N. S. (Univ. Pennsylvania Sch. Med., Philadelphia, Pa.). *Clin. Sci. Mol. Med.* 49(2): 157-169, 1975.

The acid base state of arterial blood and cerebrospinal fluid and the ventilatory response to inhaled CO_2 were evaluated in 12 patients with liver disease and the effect of liver failure in unanesthetized goat was determined. The pH, oxygen partial pressure (P_{O_2}) and CO_2 partial pressure (P_{CO_2}) in blood and cerebrospinal fluid of the patients were measured with appropriate electrodes, and arterial and cerebrospinal fluid bicarbonate concentrations were calculated from the measured P_{CO_2} and pH values. The ventilatory response to CO_2 was evaluated in both patients and animals by a modification of the rebreathing method. Liver failure was accompanied by a respiratory alkalosis in both the patients and in the goats. The P_{CO_2} was reduced and pH increased in the arterial blood; plasma bicarbonate concentrations were reduced in keeping with a partially compensated respiratory alkalosis. In the cerebrospinal fluid there was also a reduction in P_{CO_2}, a slight increase in pH, and a reduction in bicarbonate concentration. The slope of the ventilatory response to CO_2 was reduced when liver failure was severe, in patients and goats alike. There was a reduction in the extrapolated P_{CO_2} at zero ventilation, even when liver failure was mild. The mean cerebral blood flow fell by 30% after the onset of liver failure as compared with that in the control period, whereas cerebral vascular resistance increased by 40%. These changes were associated with hypocapnia, the mean arterial P_{CO_2} falling by nearly 10 mm Hg. The cerebral metabolic rate for O_2 fell by 22%. The dangers of hypercapnia in hepatic cirrhosis are confirmed by the fall in cerebral metabolic rate for O_2 induced by CO_2 breathing in the goats with liver failure. The possible clinical relevance of this adverse response to exogenous CO_2 is that cerebral function may be similarly impaired when a patient with liver failure is exposed to respiratory depressants.

6346 RESPONSE TO DOPAMINE HYDROCHLORIDE IN THE HEPATORENAL SYNDROME. *(E.)* Bennett, W. M.; Keeffe, E.; Melnyk, C.; Mahler, D.; Rosch, J.; Porter, G. A. (Univ. Oregon Med. Sch., Portland). *Arch. Intern. Med.* 135(7):964-971, 1975.

Seven patients with hepatorenal syndrome were studied before and after dopamine hydrochloride treatment (initially 2 μg/kg/min, increasing to 4-6 μg/kg/min intra-arterially and subsequently i.v.) to determine the effects of dopamine on the renal cortical vasculature and cortical blood flow rate. Five patients with decompensated cirrhosis of the liver without renal failure were also studied but were not given dopamine. Renal blood flow was measured by analysis of the washout curve of xenon 133 and selective arteriography was used to determine the status of the renal cortical vasculature. Renal pathological material was available from three cases at necropsy. Mean renal blood flow and flow rate through the cortical component were decreased in both groups of cirrhotic patients compared with a control group of normal transplant donors. Both cirrhotic groups also showed redistribution of blood from the cortex to juxtamedullary areas. After intra-arterial dopamine treatment in the hepatorenal patients, the cortical blood flow rate increased significantly, with insignificant increases in the mean renal blood flow and percent of total blood flow in component I. The antiographic findings paralleled the xenon Xe 133 curves in the hepatorenal patients and showed diffuse cortical vasospasm; in the five patients with no renal failure, the angiographic findings were within normal limits. Dopamine treatment improved the angiographic appearance of the renal cortical vasculature in the hepatorenal group. However, little improvement in renal function was noted after the i.v. dopamine infusions; urine osmolarity increased significantly and sodium excretion decreased significantly after i.v. dopamine, but changes in the urine volume and glomerular filtration rate were insignificant. Two patients survived the hepatorenal syndrome and left the hospital with normal renal function as an apparent result of dopamine treatment. No adverse reactions were noted as a result of the dopamine infusions. Renal histopathologic findings were normal in the three necropsy specimens. It is concluded that standard treatment involving symptomatic treatment of the liver disease, exclusion of the renal causes of azotemia, and intravascular volume repletion should be used in the treatment of hepatorenal syndrome.

6347 MASSIVE SPONTANEOUS PORTAL-SYSTEMIC SHUNTING WITHOUT VARICES. *(E.)* Wexler, M. J.; MacLean, L. D. (Dep. Surg., R. Victoria Hosp., Montreal, Canada). *Arch. Surg.* 110(8):995-1033, 1975.

Six patients, some with previously unsuspected liver disease or portal hypertension, with massive spontaneous portal-systemic shunts were identified by umbilical vein portal phlebography. In two patients, the shunt was between the splenic and left renal vein, while in another it was between the coronary and left renal veins. In two patients, a spontaneously reopened and patent umbilical vein served as a massive conduit anastomosing with the iliac system. In one patient, the shunt was via the inferior mesenteric vein to the hemorrhoidal plexus. None of these patients had esophageal varices and all but one were free of gastrointestinal bleeding. The spectrum of clinical manifestations varied greatly. Two totally asymptomatic patients were being investigated for splenomegaly and a third for epigastric pain; none was known to have liver disease. One patient had severe encophalopathy, while another with well-established asymptomatic liver disease since childhood was admitted with upper gastrointestinal bleeding of obscure cause. Five patients clearly demonstrated hepatofugal portal flow, while the sixth showed noticeable reduction of the portal fraction of total hepatic blood flow. All patients had small, shrunken livers, enlarged spleens, and demonstrated a striking absence of the plethora of collateral veins usually seen on venus portography in patients with portal hypertension. The spontaneous shunts resembled surgically constructed portal-systemic shunts in magnitude, and perhaps in volume of flow. Liver biopsies showed Laennec's cirrhosis in two patients, postnecrotic cirrhosis in two, and chronic aggressive hepatitis with cirrhosis in two. Spontaneous shunts may be more common than suspected in cirrhotics and may explain the lack of variceal hemorrhage in many patients.

6348 PORTAL AND SYSTEMIC EFFECTS OF SELECTIVE INFUSION OF VASOPRESSIN INTO THE SUPERIOR MESENTERIC ARTERY IN CIRRHOTIC PATIENTS. *(E.)* Millette, B.; Huet, P. M.; Lavoie, P.; Viallet, A. (Hospital Saint-Luc, Montreal, Canada). *Gastroenterology* 69(1):6-12, 1975.

The portal and systemic effects of a selective infusion of vasopressin into the superior mesenteric artery were evaluated in eight male cirrhotic patients with portal hypertension, who underwent umbilicoportal catheterization. Vasopressin was infused selectively into the superior mesenteric artery at a rate of 0.2 U/0.75 cc/min with a constant rate infusion pump for 40-60 min. Free portal venous pressure decreased significantly from 27.0 ± 1.4 mm Hg to 24.4 ± 1.4 mm Hg (9.6%). In all patients, portal oxygen pressure decreased significantly with a mean fall of 18.8%. Femoral arterial oxygen pressure decreased significantly (7.3%) while the mean femoral arterial blood pressure increased significantly (18.95) in all patients. Variable changes of the cardiac output were observed in the seven patients during the vasopressin infusion. In two patients, the cardiac output increased by 27 and 15%; in two patients, it was minimally decreased (1 and 8%), but in the other three patients it was markedly decreased by 35, 18 and 27%. It is concluded that selective infusion of vasopressin into the mesenteric circulation does not induce a marked decrease of the portal venous pressure in cirrhotic patients with portal hypertension undergoing umbilicoportal catheterization. In any controlled clinical trial, the risk of venous and/or arterial thrombosis, the decrease of portal oxygen pressure and possible systemic effects have to be considered in cirrhotic patients with ruptured varices.

6349 NEGATIVE INFLUENCES OF ASCITES ON THE CARDIAC FUNCTION OF CIRRHOTIC PATIENTS. *(E.)* Guazzi, M.; Polese, A.; Magrini, F.; Fiorentini, C.; Olivari, M. T. (Inst. Cardiovasc. Res., Milan, Italy). *Am. J. Med.* 59(2):165-170, 1975.

The negative influences of ascites on the cardiac function of 21 hospitalized men with Laennec's cirrhosis were investigated. Hemodynamic measurements were carried out with the patients in the fasting state, in the supine position and without premedication, at each of the following times: in the steady state and, resp., after removal of 500, 1000, 2000, 3000, 4000 and 5000 ml of ascitic fluid. The paracentesis was continued to remove as much fluid as could be obtained; in two patients it was 8000 ml. The hemodynamic pattern during paracentesis was characterized by no significant change in heart rate, systolic and diastolic arterial pressure, or pulmonary mean arterial and wedge pressures; progressive increase in cardiac output, stroke volume, stroke work, and mean rate of ejection of the right and left ventricle; increasing reduction in intra-abdominal pressure and in the inferior vena cava and right atrial pressures. Paracentesis was thus followed by circulatory variations which were primarily represented by improvement of right and left ventricular function, as clearly indicated by the significant increase in cardiac output exclusively due to an increment in stroke volume, by the rise in stroke work, and mean rate of systolic ejection of both sides of the heart. The improvement in cardiac function was associated with an increasing reduction in intra-abdominal, inferior vena cava and right atrial pressures. There was a direct relation between the decrease in systolic right atrial pressure and the increase in cardiac output at measured withdrawal of ascitic fluid. The average variations in systolic right atrial pressure were related to the average changes in right ventricular stroke work at measured drainage of ascites. The high caval and right atrial pressures along with the elevated abdominal pressure and the response to paracentesis suggest a mechanism in which tense ascites increase the hydrostatic intra-abdominal pressure acting on the diaphragm; this raises the intrapleural pressure, which, in turn, reduces the effective filling pressure of the heart and shifts the cardiac output curve to the right.

6350 STUDY OF PORTAL CIRCULATION WITH THE AID OF THE GAMMA CAMERA. *(Fr.)* Roucayrol, J. C.; Paraf, A.; Syrota, A.; Vinot, J. M. (Cochin Hosp., Paris, France). *Bordeaux Med.* 8(6):623-624, 1975.

6351 CIRRHOTIC ASCITES. *(Fr.)* Aron, E. (no affil.). *Ouest. Med.* 28(3):131-133, 1975.

6352 THE EFFECTS OF SOME HEPATIC FUNCTION INDICES ON THERAPY WITH UDPG, GLUTATHIONE AND VITAMIN B_{12} IN CIRRHOTICS. *(It.)* Coltorti, M. (Fac. Med. Chir. I, Univ. Naples, Italy). *Clin. Ter.* 72(4):323-328, 1975.

6353 NUTRITIONAL PROBLEMS IN CIRRHOSIS AND FOLLOWING PORTACAVAL ANASTOMOSES. *(Fr.)* Joubaud, F. (Univ. Hosp. Cent., Angers, France). *Anesth. Analg. (Paris)* 31(6):875-888, 1974.

6354 ALTERATION IN THE ACID-BASE BALANCE IN LIVER CIRRHOSIS. *(It.)* Berni, G.; Lagi, A. (Clin. Gen. Med., Med. Ther., Univ. Florence, Italy). *Recent. Prog. Med. (Roma)* 56(3):230-237, 1974.

6355 GAS CHROMATOGRAPHY URINARY STEROID PROFILE IN HEPATIC CIRRHOSIS. *(It.)* Molino, G.; Gaidano, G.; Berta, L.; Avagnina, P.; Marinone, C. (Inst. Semeiot. Med., Univ. Turin, Italy). *Boll. Soc. Ital. Biol. Sper.* 50(20):1662-1667, 1974.

6356 METASTATIC CARCINOMA IN CIRRHOTIC LIVER, STATISTICAL SURVEY OF AUTOPSIES IN JAPAN. *(E.)* Hamaya, K.; Hashimoto, H.; Maeda, Y. (Okayama Saiseikai Gen. Hosp., Japan). *Acta Pathol. Jpn.* 25(2):153-159, 1975.

6357 AUSTRALIA ANTIGEN AND MALIGNANT HEPATOMA. *(E.)* Theodoropoulos, G.; Archimandritis, A.; Angelopoulos, B. (Med. Sch., Univ. Athens, Greece). *Ann. Int. Med.* 82(6):809-810, 1975.

6358 UNILATERAL NEVOID TELANGIECTASIA WITH GASTRIC INVOLVEMENT. *(E.)* Anderton, R. L.; Smith, Jr., J. G. (Med. Coll. Georgia, Augusta). *Arch. Dermatol.* 111(6):617-621, 1975.

6359 FLUID RETENTION IN LIVER DISEASE. *(E.)* Blendis, L. M. (Central Middlesex Hosp., London, England). *Br. J. Hosp. Med.* 13(1):47-54, 1975.

6360 ARTERIAL PORTOGRAPHY IN THE MANAGEMENT OF PORTAL HYPERTENSION. *(E.)* Legge, D. A.; Whelton, M.; Hennessy, T. (St. Finbarr's Hosp., Cork, England). *Ir. J. Med. Sci. (Dublin)* 144(3):92-101, 1975.

6361 CIRRHOSIS OF THE LIVER. *(E.)* McIntyre, N. (R. Free Hosp., London, England). *Br. J. Hosp. Med.* 13(1):8-16, 1975.

6362 SPLENIC PORTOGRAPHY IN THE EVALUATION OF THE MESOCAVAL SHUNT WITH A DACRON PROSTHESIS. *(It.)* Peracchia, A.; Morosini, S.; Roncoroni, L. (Inst. Clin. Gen. Surg., Surg. Ther., Parma, Italy). *Ateneo Parmense* [*Acta Biomed.*] 45(3):93-111, 1974.

6363 PRESINUSOIDOL HEPATIC ARTERIOPORTAL SHUNT. ANGIOGRAPHIC VISUALIZATION IN LIVER CIRRHOSIS. *(Fr.)* Osteaux, M.; Jeanmart, L. (Radiodiagn. Serv., Bordes Inst., Brussels, Belgium). *J. Belg. Radiol.* 57(3):205-210, 1974.

6364 RECENT ASPECTS OF THE TREATMENT OF PORTAL HYPERTENSION IN CIRRHOTICS. *(Fr.)* Kestens, P. J.; Lambilliotte, J. P. (Clin., Univ. St. Pierre, Louvain, Belgium). *Acta Gastroenterol. Belg.* 37(9): 383-401, 1974.

6365 PREDICTING THE CAUSE OF GASTROINTESTINAL BLEEDING IN CIRRHOTICS AS A FUNCTION OF THE EXTENT OF HEPATOCELLULAR INSUFFICIENCY. *(Fr.)* Franco, D.; Deporte, A.; Bismuth, H. (Paul Brousse Hosp., Villejuif, France). *Biol. Gastroenterol. (Paris)* 7(4):330-331, 1974.

6366 THE FATE OF AMINO ACIDS PERFUSED IN MALNOURISHED ALCOHOLICS WITH CIRRHOSIS. *(Fr.)* Michel, H.; Raynaud, A.; Mourrut, B.; Bellet, H.; Sany, C.; Bertrand, L. (St. Eloi Hosp., Montpellier, France). *Biol. Gastroenterol. (Paris)* 7(4):329, 1974.

6367 TREATMENT OF LIVER COMA AND HEPATIC ENCEPHALOPATHY. *(Ger.)* Lelbach, W. K. (Med. Clin., Univ. Bonn, Germany). *Med. Welt* 25(46):1921-1926, 1974.

6368 AN UNUSUAL SCINTIGRAPH OF LIVER CIRRHOSIS. *(Ger.)* Dressler, J.; Kramann, B. (Clin. Polyclin. Nucl. Med., Tech. Univ. Munich, Germany). *Fortschr. Geb. Roentgenstr. Nuklearmed.* 122(2):174-175, 1975.

6369 THE BUDD-CHIARI SYNDROME: SYMPTOMATOLOGY IN A YOUNG WOMAN WITH A POSTHEPATIC BLOCK. *(Ger.)* Deeg, P.; Schneider, K. W.; Jesse, R. (Med. Clin., Univ. Wurzberg, Germany). *Med. Monatsschr.* 29(2):78-82, 1975.

6370 ENCEPHALOPATHY WITH ACQUIRED CHRONIC CIRRHOSIS OF THE LIVER. *(Ger.)* Noetzel, H.; Weber, M. (Inst. Pathol., Univ. Freiburg, Germany). *Med. Welt* 26(4):163-166, 1975.

6371 CLINICAL EVALUATION OF THE SERUM IRON CONCENTRATION IN CHILDHOOD CIRRHOSIS. *(Rus.)* Plaksina, G. B.; Dedikova, L. A. (M. F. Vladimirskii Reg. Res. Inst. Clin. Med., Moscow, USSR). *Pediatriia* (3):61-62, 1975.

6372 SURGICAL SURVIVAL IN PATIENTS WITH CIRRHOSIS ASSOCIATED WITH PORTAL HYPERTENSION. *(Rus.)* Dushanin, S. A.; Ekzarkhov, B.A.; Morev, A. G.; Boichuk, G. K.; Molchanov, A. I. (Kharkov Res. Inst. Gen. Emergency Surg., USSR). *Klin. Khir.* (2):45-49, 1975.

6373 THERAPY OF DECOMPENSATED CIRRHOSIS. *(It.)* Albano, O.; Francavilla, A.; Leo, M.; Centonze, M.; Salerno, M. T. (no affil.). *Rass. Clin. Sci.* 50(1):1-10, 1974.

6374 THERAPY OF COMPENSATED CIRRHOSIS. *(It.)* De Pergola, E. (no affil.). *Rass. Clin. Sci.* 50(1):11-15, 1974.

6375 ETIOLOGICAL DIAGNOSIS OF GASTROINTESTINAL HEMORRHAGE IN CIRRHOTICS. *(Por.)* Miniconi, P. (no affil.). *J. Med. (Lisboa)* 87(1642): 174-176, 1975.

See also, 5415, 5694, 6086, 6094, 6097, 6100, 6105, 6127, 6187, 6236, 6245, 6246, 6273, 6277, 6289, 6292, 6296, 6297, 6300, 6301, 6328.

LIVER AND BILIARY TRACT

Gallbladder and Biliary Tract Diseases

6376 PROLONGED SECRETION OF LITHOGENIC BILE AFTER CHOLECYSTECTOMY. *(E.)* McDougall, R. M.; Walker, K.; Thurston, O. G. (Dep. Surg., Univ. Alberta, Edmonton, Canada). *Ann. Surg.* 182(2):150-153, 1975.

The possible secretion of a lithogenic bile following cholecystectomy for cholesterol gallstones was studied in eight patients 1.5 to 23 yr after cholecystectomy for presumed cholesterol gallsones. The cholesterol, lecithin, and bile acid levels in the hepatic bile of these subjects were compared with the levels in the gallbladder bile of 15 patients currently undergoing cholecystectomy for pure and mixed cholesterol gallstones in functional gallbladders. Bile was obtained by needle or T-tube aspiration of the common bile duct, duodenal catheter aspiration, or *via* gastrostomy tube. The hepatic bile samples for the subjects who had undergone cholecystectomy 1.5 to 23 yr previously were saturated or supersaturated with cholesterol in all cases, the mean lithogenic index for this group being 1.31. The bile in the 15 patients currently undergoing cholecystectomy was supersaturated with cholesterol in all but three cases, the mean lithogenic index being 1.41. The mean value of molar percent cholesterol in the current cholecystectomy group was 14.0, while that in the previous cholecystectomy group was 12.7. In the previous cholecystectomy group, bile supersaturated with cholesterol did not become less saturated with time. The data support the concept that, once begun, the production of a lithogenic bile by the liver is a lifelong phenomenon.

6377 STUDY OF CHOLELITHIASIS ASSOCIATED WITH CHRONIC PANCREATITIS. *(Fr.)* Callet, B.; Bernades, G.; Dupuy, R. (Beaujon Hosp., Clichy, France). *Arch. Fr. Mal. App. Dig.* 63(8):625-630, 1974.

Cholelithiasis was diagnosed in 17 (14 men and three women) of 101 patients with chronic pancreatitis. Chronic alcoholism (100 ml/day of pure alcohol for at least 2 yr) was present in 80 cases (75 men and five women) and pancreatic calcifications were detected in 71 cases. The diagnosis of cholelithiasis was made before that of chronic pancreatitis in three cases, simultaneously in ten cases and afterwards in four. No significant differences in sex, frequency of chronic alcoholism or acute pancreatitis, presence of pancreatic calcifications or associated cirrhosis or the course of chronic pancreatitis (regression, stabilization, exacerbation) were found between patients with chronic pancreatitis and those with chronic pancreatitis and cholelithiasis. Patients with cholelithiasis averaged 10.5 yr older at the onset of symptoms of chronic pancreatitis and 7.6 yr older at the diagnosis of chronic pancreatitis. Of the patients with cholelithiasis, 16 underwent surgery for cholecystitis (nine cases), prolonged cholestatic jaundice (six cases), or pancreatectomy (one case); the remaining patient died of cirrhosis and cholelithiasis was found at autopsy. It is concluded that the association between chronic pancreatitis and cholelithiasis is fortuitous and that cholelithiasis appears to play no role in the pathogenesis of chronic pancreatitis.

6378 TREATMENT OF PATIENTS WITH CHOLESTEROL GALLSTONES WITH CHENODEOXYCHOLIC ACID: CHANGES IN BILE ACID METABOLISM. *(Ger.)* Stiehl, A.; Raedsch, R.; Regula, M.; Kommerell, B. (Med. Clin., Univ. Heidelberg, Germany). *Inn. Med.* 2(1):13-18, 1975.

Chenodeoxycholic acid (CDC, 1.5 g/day) was used to treat ten patients, aged 35-74 yr, with cholesterol gallstones. Bile acid determinations were performed on fasting blood samples, 24-hr urine specimens and bile before and at various periods after institution of CDC therapy. CDC produced marked changes in the bile salt pool: significant increases occurred in CDC, ursodeoxycholic and lithocholic acids. While less than 5% of CDC, ursodeoxycholic, cholic and deoxycholic acids were present as the sulfate ester after administration of CDC, 67.4% of lithocholic acid was found in this form. Administration of CDC almost tripled serum concentrations of nonsulfated CDC and lithocholic acid, while serum levels of the sulfate esters of these acids remained almost the same. Only traces of ursodeoxycholic, deoxycholic, and cholic acids were found in the serum of these patients after CDC therapy. Administration of CDC significantly increased urinary excretion of the sulfate esters of CDC and lithocholic acids. In patients receiving CDC, serum concentrations of nonsulfated CDC, but not those of nonsulfated lithocholic acid, were increased by a test meal. These findings suggest that increases in serum bile acid concentrations may be due to a spillover of the bile acid pool. This spillover is increased by administration of a test meal. Since animal experiments have demonstrated that the sulfate ester of lithocholic acid is much less hepatotoxic than the acid itself, extensive sulfation of lithocholic acid in patients given CDC may be a mechanism protecting against liver injury.

6379 THERAPEUTIC PROPERTIES OF A CHOLERETIC AGENT, FLASTAPIOL, IN BILIARY DISEASE IN CHILDREN. *(Ukr.)* Shmorhun, S. S.; Zinchenko, T. V.; Maksiutina, N. P. (Kiev Inst. Postgrad. Med., USSR). *Pediatr. Akush. Ginekol.* 36(2):22-24, 1974.

Therapeutic application of flastapiol, a drug prepared from extracts of parsley fruit *(Petroselinum sativum)*, *Stachys recta* (a hedge-like perennial native to southeastern Europe and the Caucasus), sandwort (*Helichrusum arenarium*), pectin and sugar showed very good results in curing biliary disease in children. The drug was administered to patients aged 5-15 yr three times a day in the following doses: children 5-8, 0.5 g; children 9-12, 0.75 g; and children over 13, 1.0 g. Treatment lasted 14-26 days. Subjected to the study were 60 children: 36 with angiocholecystitis; 10 with cholecystitis; and 14 with angiocholitis. Treatment with flastapiol showed in general quick subjective improvement in the health of patients, a decrease in swelling of the inflamed liver, and the disappearence of abdominal pains. In addition, flastapiol showed very strong curing action on inflamed bile ducts. After treatment, the signs of inflammation in the duodenum of 51 (out of 60) children disappeared completely; five showed strong suppression; four, no effect. As a result of this clinical study, authors strongly recommend flastapiol, a drug with stimulating property on bile secretion of liver, as well as with spasmolytic, diuretic, and detoxicating properties for the treatment of biliary disease in children.

6380 KINETICS OF TRIGLYCERIDE METABOLISM DURING CHENODEOXYCHOLIC ACID THERAPY. *(Ger.)*

Begemann, F. (Eppendorf Univ. Hosp., Hamburg, Germany). *Z. Gastroenterol.* 13:314-317, 1975.

By using Farquhar's two-compartment model and precursor labeling with ^{14}C-palmitic acid, administered i.v., triglyceride kinetics were studied in five patients with cholelithiasis who were receiving 10-15 mg/kg of chenodeoxycholic acid. After 8 weeks of therapy, plasma triglyceride levels had decreased 10 to 20%. Studies performed before and after 8 weeks of drug therapy in three cases showed that decreased plasma triglyceride levels were associated with a decrease in the rate of plasma triglyceride turnover. This demonstrated that decreased plasma triglycerides were due primarily to a decrease in the rate at which endogenous triglycerides entered the plasma and not to an increase in peripheral catabolism. These findings could either be attributed to a decrease in endogenous triglyceride synthesis or to a decrease in plasma secretion of these triglycerides. Since the supply of triglyceride for plasma secretion increased in two cases and decreased in one, the results were inconclusive.

6381 CONGENITAL BILIARY ATRESIA. *(Ger.)*

Kleinteich, B.; Schickedanz, H. (Surg. Clin., Friedrich Schiller Univ., Jena, Germany). *Wiss. Z. Friedrich Schiller Univ. Jena, Math. Naturwiss. Reihe* 23(3/4):609-623, 1974.

In a 12-yr period, atresia of the extrahepatic biliary tract was successfully treated in only one of ten infants (six girls and four boys). Of these patients, seven had no symptoms for the first 2 weeks after birth, although acholic stools were present from birth in nine cases. The single exception was a girl whose stools became acholic 3 weeks after birth, but regained their normal color after 1 week. Laparotomy, performed at 6 weeks of age, showed atresia of the intrahepatic bile ducts and of the hepatic duct. However, since it was possible to pass a tube through the common bile duct, and contrast medium (injected into the gallbladder) passed through the bile duct and into the duodenum, accessory bile ducts were probably present. All patients eventually developed jaundice and hepatomegaly; only two had splenomegaly. Serum bilirubin levels, which ranged from 7.8 to 15.8 mg/100 ml, were not correlated with age, and direct bilirubin values were higher than indirect values in all cases. While no urobilinogen was detected in the urine in any of these infants, bilirubin was present in six cases. The WBC was increased (10,000 to 17,000 WBC/mm^3) in all cases. None of the patients had any evidence of syphilis, toxoplasmosis or listeriosis. At laparotomy, only two patients had operable forms, and choledochoduodenostomies were performed. One of these operated patients died 2 weeks after surgery, with liver failure due to progressive biliary cirrhosis. The other operated infant proved to have atresia of only a short segment of the common bile duct anterior to the papilla of Vater; all other extrahepatic bile ducts were normal. Bile and many small, pigmented gallstones were present in the common bile duct. The patient was discharged and remained in good condition 12 yr after surgery. Autopsies, performed in seven of the nine infants, showed that the cause of death was cirrhosis. Associated gastrointestinal anomalies were found in three patients, which consisted of hepatic, pancreatic, and intestinal malformations (one case), ileal stenosis (one case) and cystic fibrosis (one case).

6382 EMPHYSEMATOUS CHOLECYSTITIS: REPORT OF TWO CASES. *(Fr.)*

Samson, E.; Kibrite, A.; Roy, J. P. (L'Hôtel-Dieu de Quebec Hosp., Quebec City, Canada). *Can. J. Surg.* 18(2):192-196, 1975.

Two new cases of emphysematous cholecystitis, a relatively rare disorder, are reported and compared to other cases from world literature. Both patients were male; one of them was diabetic. Both men presented with abdominal pain of sudden onset, which was localized around the right hypochondrium, extending to the shoulders in one case and to the paraumbilical region in the other. Simple radiography of the abdomen demonstrated a gas-filled gallbladder which led to the diagnosis of emphysematous cholecystitis. Surgery, supported by antibiotics, revealed gas, stones and distended gallbladder in both patients, with necrosis of the vesicular wall in one, and onset of necrosis in the other. It is felt that none of the etiological theories proposed thus far can be accepted or rejected, due to very limited experience with emphysematous cholecystitis.

6383 EFFECTIVENESS AND LIMITATIONS OF INTRAVENOUS CHOLANGIOGRAPHY IN PANCREATIC DIAGNOSIS. *(Ger.)*

Frommhold, W.; Frommhold, H. (Inst. Med. Radiol., Univ. Tubingen, Germany). *Leber Magen Darm* 4(5):212-221, 1974.

Intravenous cholangiography can be used only to a very limited extent in the differential diagnosis of pancreatic disease because: (1) pancreatic diseases produce nonspecific morphological changes in the extrahepatic biliary tract and (2) good visualization of the common bile duct, which is necessary for the detection of these changes, cannot be obtained in 10 to 15% of i.v. cholangiograms. However, better analyses of the distal common bile duct can be obtained by infusing, rather than injecting, contrast medium and by using tomography and zonography. Zonography is also useful in detecting stones that do not produce shadows with conventional radiological techniques. Changes in the distal common bile duct are not necessarily specific for mechanical obstructions of the papilla since they can also be seen in diseases involving the head of the pancreas. Similarly, changes produced in the common bile duct by chronic pancreatitis or fibrosis of the head of the pancreas are also observed in pancreatic tumors or cholangiocarcinomas. However, these changes, when associated with pancreatic calcifications, suggest a diagnosis of chronic pancreatitis. Secondary changes in the common bile duct caused by acute pancreatitis are difficult to interpret. Pancreatic pseudocysts and retention cysts in the head of the pancreas occasionally displace and compress the common bile duct. Carcinomas of the head of the pancreas often displace the intrapancreatic part of the common bile duct in a lateral-convex manner, but similar changes also occur in pancreatitis. If a malignant tumor in the head of the pancreas produces stenosis in the upper biliary tract, cholangiocarcinomas and inflammatory processes, e.g. stenotic cholangiolitis, must be considered in a differential diagnosis. In low stenosis of the common bile duct with prestenotic dilatation of the proximal part, both papillary carcinoma and cicatricial, inflammatory changes in the head of the pancreas are possible diagnoses. In a few cases, i.v. cholangiography, in association with other conventional radiological techniques, e.g. barium swallow or hypotonic duodenography, may be helpful in the differential diagnosis of pancreatic disease, but in most cases it can only be regarded as a tool useful in preliminary diagnosis.

6384 GALLSTONES IN CHILDHOOD. *(Ger.)* Kock, H. J.; Reuter, G.; Noack, R. (Clin. Pediatr. Surg., Berlin, Germany). *Kinderaerztl. Prax.* 42(11):481-486, 1974.

Case reports are presented for six children (five girls and one boy, aged 9-14 yr) who were treated for cholelithiasis in a 17-yr period. Only two of these patients developed jaundice; one also had hepatomegaly and signs of parenchymal liver damage. Radiological findings were negative in three of the five children examined. Cholecystolithiasis alone was diagnosed in two cases. In one case it was associated with stenosis of the papilla of Vater and dilatation of the cystic and common bile ducts and in three cases with choledocholithiasis. In addition to cholecystectomy, two patients underwent choledochoduodenostomy and one underwent revision of the common bile duct. Gallstones, analyzed in five cases, consisted of cholesterol alone in four and mixed cholesterol-calcium oxalate stones in one.

6385 THE DISSOLUTION OF GALLSTONES WITH AND WITHOUT CHENODEOXYCHOLIC ACID. *(Ger.)* Mockel, G. (Hosp. TABEA, Hamburg-Blankenese, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:451-455, 1974.

For 9 months, a group of 25 patients (eight men and 17 women, aged 26-70 yr) with cholelithiasis were treated with chenodeoxycholic acid (average daily dose of 1 g). The following were considered contraindications for chenodeoxycholic acid therapy: (1) liver disease, wasting diseases, gastrointestinal disease with diarrhea, hematological disease, and impaired renal function; (2) pregnancy; and (3) patients in whom surgery was indicated. Almost no side effects occurred when this dose was used, while at higher dosages a few patients developed diarrhea. Diarrhea was alleviated by reducing the dosage to 0.75 to 1.0 g. Routine transaminase determinations showed no changes. Multiple gallstones, about the size of grains of rice, had disappeared from a 64-yr-old patient after 6 months of treatment with chenodeoxycholic acid. A 58-yr-old woman, who originally had six gallstones the size of cherries, had only two on a radiological examination performed after 8 months of treatment. In both cases, the gallstones had been dissolved without the development of any symptoms. Because gallstones tend to recur after they have dissolved, these patients continued to receive chenodeoxycholic acid.

6386 INCREASING PRODUCTION OF THE SULFATE ESTER OF LITHOCHOLIC ACID DURING CHENODEOXYCHOLIC ACID TREATMENT. *(Ger.)* Raedsch, R.; Stiehl, A. (Med. Clin., Univ. Heidelberg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:447-448, 1974.

Since the concentrations of chenodeoxycholic acid (CDCA) and lithocholic acid (LCA) increase in the bile of patients undergoing treatment of cholelithiasis with CDCA and the concentrations of these bile acids might be hepatotoxic, studies were performed to determine whether the relative percentages of their sulfate esters increase and what serum and urinary bile acid concentrations are during CDCA therapy. In patients with cholesterol gallstones given 1.5 g/day of CDCA p.o., the nonsulfated fraction of serum CDCA increased significantly from 0.9 to 2.7 μg/ml, while only a slight increase occurred in the sulfated fraction of serum CDCA. The serum concentration of nonsulfated LCA increased significantly from 0.2 to 0.7 μg/ml, and the serum concentration of LCA sulfate increased significantly from 0.1 to 0.5 μg/ml. Since bile acid concentrations in the serum are subject to considerable circadian variations, their urinary excretion was measured in 24-hr urine samples. Little increase occurred in the urinary excretion of nonsulfated CDCA, but excretion of the sulfate ester of this bile acid increased significantly from 0.3 to 0.5 mg/24 hr. While urinary excretion of nonsulfated LCA underwent no appreciable change, the excretion of LCA sulfate increased from 0.4 to 0.6 mg/24 hr. Differences between blood concentrations and urinary excretion of the sulfate esters during CDCA therapy are attributed to their greater glomerular filtration or lower reabsorption in the proximal tubules than nonsulfated bile acids. Before and during CDCA therapy, the relative percentage of the sulfate ester of CDCA in the bile was 0.7%, while the relative percentage of the sulfate ester of LCA increased significantly from 3.8 to 37.7% after 8 weeks of therapy. Accumulation of LCA in the body is prevented by increased synthesis of its sulfate ester since the reabsorption of the sulfate ester is decreased in the intestine and its renal excretion is increased.

6387 VARIATIONS IN TOTAL BILE ACIDS AND THE ACTIVITIES OF SOME ENZYMES USED AS INDICATORS OF CHOLESTASIS IN THE BILE OF PATIENTS AFTER SURGERY. *(Ger.)* Massarrat, S.; Arendt, D.; Kordes, B.; Bauer, E.; Tucke, M. (Med. Clin., Univ. Marburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:530-533, 1974.

Starting 3 days after surgery, the rate of bile secretion was measured, and determinations of total bile acids and enzymes used as indicators of cholestasis (alkaline phosphatase, γ-glutamyltranspeptidase, and leucine aminopeptidase) were performed on bile samples taken from T-tubes in 11 patients with jaundice caused by cholelithiasis and in ten anicteric patients with cholelithiasis. Bile samples were taken at 7 and 11 a.m. and at 4 and 9 p.m. In both groups of patients, very close correlations were found between the secretion of bile acids/min and alkaline phosphatase activity/min and between the secretion of bile acids/min and the volume of bile secreted/min. Close correlations were also found between alkaline phosphatase and γ-glutamyltranspeptidase activities in both groups of patients. When enterohepatic circulation was reestablished by raising the T-tube, bile acid concentrations increased; bile acid concentrations and alkaline phosphatase and γ-glutamyltranspeptidase activities showed circadian variations. Bile acid concentrations and enzyme activities were highest at 7 and 11 a.m., decreased after lunch and, after a dinner at 6 p.m., increased again at 9 p.m. This suggests that bile acid concentrations and enzyme activities are subject to a circadian rhythm, but the effect of food ingestion cannot be ruled out. Changes in the alkaline phosphatase activity in the bile proved to be a better indication of changes in concentration than did the bile acid concentration.

6388 TURNOVER OF PLASMA CHOLESTEROL IN PATIENTS WITH CHOLESTEROL GALLSTONES.

(E.) Pedersen, L.; Arnfred, T.; Thaysen, E. H. (Dep. Med., Alborg Hosp. North, Denmark). *Acta Med. Scand.* 197(5):421-425, 1975.

Some kinetic parameters of cholesterol synthesis were measured in eight Caucasian patients with radiolucent gallstones (in well functioning gallbladders) and in two healthy controls. 1-α-2-α-^{3}H-cholesterol in ethanol solution (2 to 3 ml) was administered i.v. to all subjects. In three patients, the half-life of the radiocholesterol in the circulation was 10 min and the distribution of radioactivity in the lipoproteins was similar to that of cholesterol in healthy controls. Fasting plasma samples were obtained once or twice weekly from all subjects for 10 weeks following injection of the tracer, and the plasma cholesterol and plasma triglyceride levels were determined. In each subject some kinetic parameters were also calculated, including the input into and size of the cholesterol pool. The results were compared with those from 16 controls in a previous study. The statistical analysis failed to demonstrate significant differences between the gallstone patients and compiled controls in any of the parameters studied. The results indicate that patients with cholesterol gallstones have normal rates of input of cholesterol into the rapidly exchangeable cholesterol mass. It is suggested that the absorption of exogenous cholesterol may be decreased in gallstone patients.

6389 ADENOMYOMATOSIS OF THE GALLBLADDER.

(E.) Ram, M. D.; Midha, D. (Huron Road Hosp., Cleveland, Ohio). *Surgery* 78(2):224-229, 1975.

Adenomyomatosis of the gallbladder in 27 patients was reviewed to investigate the nature and treatment of the disease. Nine were diagnosed directly by radiography, 14 had gallstones, three had a nonvisualized gallbladder, and one case was discovered on surgery. Ages ranged from 21-72 yr with the highest incidence in the sixth and seventh decades of life. Of the 27, 25 were white and 17 were female. Clinical features included pain in the right hypochondrium, dyspepsia and fatty food intolerance. Duration of symptoms ranged from 3 months to 7 yr. Cholecystectomy was performed in each case. Two patients died of unrelated causes; 25 were asymptomatic six months later, and 20 who were followed up to a maximum of 7 yr remained asymptomatic. Radiology showed morphological changes best after a fatty meal. Contrast filled the dilated elements in the wall in the form of a saw-tooth edge along the margin. In the segmental variety of the disease, concentric narrowing was seen. Pathology showed gross thickening of the wall, confined to a definite area in the segmental and localized varieties. Histologically there was hyperplasia of the epithelial and muscular elements, intramural diverticulosis extending into the subserosal plane, and thickening of cell layers. It is concluded that the disease is probably due to a combination of proliferation and degeneration associated with functional dyskinesia, and is curable by cholecystectomy.

6390 EARLY FORMATION OF GALLSTONES FOLLOWING JEJUNOILEAL BYPASS FOR TREATMENT OF MORBID OBESITY.

(E.) Neshat, A. A.; Flye, M. W. (Duke Univ. Med. Cent., Durham, N.C.). *Am. Surg.* 41(8): 486-491, 1975.

A case of cholelithiasis and acute cholecystitis immediately following a jejunoileal bypass is presented. A 30-yr-old male presented with morbid obesity. All laboratory studies were within normal limits, except alkaline phosphatase levels 90 mμ/ml. Jejunoileal bypass was performed, at which time the gallbladder was found to be grossly normal without palpable calculi. Liver biopsy showed minimal fatty changes. He was discharged 2 weeks after surgery, but presented 6 days later with epigastric pain, nausea, and vomiting. He responded to bed rest, propantheline bromide and bland diet, and was discharged after 3 days. Five weeks after surgery he presented with abdominal pain and fatty food intolerance. Oral cholecystography revealed multiple small stones in the gallbladder. He responded to conservative treatment. Two weeks later he presented with right upper quadrant pain, nausea and vomiting. Laboratory tests showed uric acid (7.1 mg%), alkaline phosphatase (175 mμ/ml), and serum iron (62 mg%). Cholecystectomy was performed and multiple small, mushy gallstones were found. Analysis showed them to be composed of cholesterol and calcium bilirubinate. Liver biopsy showed severe fatty changes. It is suggested that typical postoperative metabolic changes, mostly of fat and protein malabsorption, potassium and calcium loss from diarrhea, and bile stasis from obesity affected the cholesterol to bile salt plus lecithin ratio in the bile, resulting in stone formation.

6391 CLINICOPATHOLOGICAL STUDIES ON THE RELATIONSHIP BETWEEN CHOLELITHIASIS AND CHRONIC PANCREATITIS.

(E.) Sato, T.; Saitoh, Y.; Noto, N.; Matsuno, S.; Tokutake, K. (Tohoku Univ. Sch. Med., Sendai, Japan). *Tohoku J. Exp. Med.* 113(2):97-111, 1974.

To clarify the relation between cholelithiasis and chronic pancreatitis, biopsies of the pancreas were obtained at laparotomy from 151 patients (69 men and 82 women, aged < 19 to > 80 yr) with cholelithiasis, and the secretin test of pancreatic exocrine function performed on 119 of these patients. Histologic findings were compared with those obtained in 31 patients with gastric cancer. Pancreatic exocrine function was normal in 89 (74.8%) of the 119 patients who underwent the secretin test, slightly disturbed in 25 (21.0%), moderately disturbed in 4 (3.4%), and markedly disturbed in 1 (0.8%). Of the 30 patients with disturbance, 17 had reduced maximum bicarbonate concentration, 10 had reduced volume of duodenal aspirate, and 9 had reduced total amylase output. Moderate or marked disturbance of pancreatic exocrine function was significantly more frequent in patients with bacteria in bile, dilation of the bile duct, and hypercholesterolemia. Results of the secretin test showed a significant correlation with the frequency and grade of histologic changes in the pancreas: while 75-78% of the patients with a normal test showed no histologic change, 4 of 5 with a moderate or marked disturbance in the secretin test had marked histologic changes. However, no significant difference in grade and frequency of histological change in the pancreas was demonstrated between patients with cholelithiasis and controls. In addition, histologic findings did not correlate with location and type of gallstones or with duration of symptoms. Only 5 (3%) of the 151 patients with cholelithiasis had chronic pancreatitis. The results support previous findings that the frequency of pancreatitis is not high in patients with cholethiasis even though there should be common constitutional factors existing between cholelithiasis and chronic pancreatitis.

6392 ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY FOLLOWING BILIARY SURGERY.

(Ger.) Stadelmann, O.; Kaufer, C.; Bogusch, G.; Miederer, S. E.; Sobbe, A.; Slotter, H.; Loffler, A. (Med. Polyclin., Univ. Bonn, Germany). *Leber Magen Darm* 4(5):201-211, 1974.

Endoscopic retrograde cholangiopancreatography (ERCP) was performed on 113 patients who had undergone biliary surgery and had postoperative upper abdominal discomfort, signs of cholestasis, or laboratory findings suggestive of biliary obstruction. ERCP was used only if i.v. cholangiography could not be performed or gave no clearcut diagnostic information. In cases in which at least one system of ducts was visualized, the biliary tract was visualized in 80% and the pancreatic tract in only 66%. In 52 cases, both pancreatic and biliary ducts were visualized; in 38, only the biliary ducts; and in 23, only the pancreatic ducts. Pathological changes were detected in 72 cases (64%); in the biliary tract in 61 of 90 cholangiograms and in 22 of the 75 pancreatograms; in 11 cases both systems were affected. The most commonly encountered changes in the biliary tract were papillary stenosis (39 cases), gallstones (11), and stenosis associated with gallstones (9). Hydatid disease of the liver was associated with prepapillary stenosis in one case, and Caroli's syndrome was associated with choledocholithiasis in another. Pancreatic disease, diagnosed in 15 cases, consisted of chronic pancreatitis in 11 patients and pancreatic carcinomas in four. The diameters of the common bile duct and hepatic ducts increased with age and in patients who had undergone cholecystectomy, providing that no pathological changes, particularly obstructions, were present. Some patients who had undergone choledochoduodenostomy developed blind loop syndrome and papillary stenosis. It is recommended that this procedure be combined with papillotomy.

6393 CHANGES IN BILE ACID METABOLISM DURING TREATMENT WITH CHENODEOXYCHOLIC ACID.

(Ger.) Stiehl, A. (Med. Clin., Univ. Heidelberg, Germany). *Z. Gastroenterol.* 13(suppl.):300-301, 1975.

In 10 patients with cholelithiasis, serum levels of nonsulfated chenodeoxycholic acid (CDCA) increased significantly from 0.9 μg/ml to 2.7 μg/ml during treatment with 1.5 g/day CDCA; CDCA sulfate levels remained essentially the same. After a test meal, serum CDCA values increased still further to 4.6 μg/ml, while CDCA sulfate only increased to 0.5 μg/ml. Serum lithocholic acid concentrations also increased significantly from 0.2 μg/ml before treatment to 0.7 μg/ml during treatment; the sulfate ester level of this acid also increased from 0.1 to 0.5 μg/ml. No appreciable changes occurred in levels of serum lithocholic acid or its sulfate after a test meal. Urinary excretion of CDCA increased only slightly (from 0.5 to 0.6 mg/24 hr) during CDCA treatment, while urinary excretion of its sulfate ester increased significantly (from 0.2 to 0.5 mg/24 hr). Similar results were obtained for urinary excretion of lithocholic acid and its sulfates. Bile acid determinations performed on bile from these patients revealed that during CDCA therapy the relative percentage of CDCA increased from 47% to 72%; ursodeoxycholic acid, from 2% to 17%; and lithocholic acid, from 1% to 3%. The relative percentage of cholic acid in their bile decreased from 41% to 4%, and that of deoxycholic acid, from 9% to 3%. All of these changes were significant. Before CDCA therapy, only 22.5% of lithocholic acid in the bile was present as the sulfate ester; during therapy this increased steadily to 67.5%. Since lithocholic acid is hepatotoxic, it is suggested that formation of its sulfate ester is a protective mechanism which leads to its rapid detoxification and excretion.

6394 SCANNING ELECTRON MICROSCOPE STUDIES OF THE MUCOSAL SURFACE IN THE GALLBLADDER IN CHOLECYSTITIS AND CHOLELITHIASIS.

(Ger.) Wagner, R.; Krieg, H. (Pathol. Inst., Johannes Gutenberg Univ., Mainz, Germany). *Z. Gastroenterol.* 13(2):348-355, 1975.

To determine the extent to which structural changes in the gallbladder mucosa contribute to lithogenesis, the mucosal surface of gallbladders removed from 11 women with cholecystitis was examined under the scanning electron microscope. Cholecystitis was associated with a polyp in one case and with cholelithiasis in 10. In the gallbladder from the patient with the polyp, the mucosal surface contained folds of various widths and depths which were located so close to one another that the crypts could not be seen; a few adhesions were observed between adjacent folds. The epithelium consisted of polygonal cells of various sizes. Microvilli of various heights were detected on the apical parts of these cells. In a few places, very small processes, called antennulae, projected from the protuberances on the distal ends of the microvilli. In gallbladders from seven patients with chronic cholecystitis, the mucosal relief was flattened so that the crypts could be seen. While some deep crypts measured 5-80 μ in diameter, shallow crypts were considerably wider. In addition to these changes, the mucosal surface in two patients with acute cholecystitis contained epithelial ulcerations containing fibrils of collagen and fibrin. There were many loose cells, mostly RBC, among the fibrils; some cells were deformed by the fibrin. Intracellular spaces were increased in width and some contained microvilli of different heights. Microliths were detected near isolated necrotic cells and the flattened epithelium, while larger stones were present in the crypts. In addition to a few pigment stones, stones of pure cholesterol were found. Older solitary stones of cholesterol were joined to form thick plates, while multiple, recently formed cholesterol stones consisted of thin, loosely joined plates. It is suggested that the microliths might produce cellular necrosis, resulting in an increase in the size of the stones and in the width of the crypts and causing flattening of the mucosal relief. However, it is not known whether this process is produced by cholecystitis or whether inflammation results from stone formation.

6395 SPONTANEOUS ENTEROBILIARY FISTULAS: SURGICAL EXPLORATION AND SURGICAL POLICY. EIGHT CASES.

(Fr.) Chartier, P. (no affil.) *Ouest Med.* 27(18):1673-1682, 1974.

To illustrate the causes of internal enterobiliary fistulas and surgical procedures for treating them, case reports are presented for eight patients (five women and three men, aged 41-82 yr). These patients constituted 4.3% of all 189 patients who underwent biliary surgery. A 63-yr-old man with a cholecystoduodenal fistula and a gallstone obstructing his duodenum was treated by cholecystectomy and duodenal suture, as was a 68-yr-old woman who had a cholecystoduodenal fistula associated with a sclerotic, atrophic gallbladder. A cholecystoduodenal fistula associated with a duodenal ulcer in a 41-yr-old man was treated by a Péan-type gastrectomy, cholecystectomy, and insertion of a Kehr drain. A 66-yr-old man with a choledochoduodenal fistula, who had undergone two operations for peptic ulcer complications, was treated by gastrectomy, a Y-shaped enterobiliary anastomosis, and Finsterer's gastrojejunostomy. A cholecystocholedochal fistula, associated with gallstones in the gallbladder, common bile duct, and liver in a 82-yr-old woman, was treated by cholecystectomy, choledochotomy, and choledochoduodenal anastomosis. A 79-yr-old woman who had a duodenocholedochal fistula, a duodenal diverticulum, cholangitis, and cancer with partial obstruction of the transverse colon underwent cholecystectomy, resection of the duodenal diverticulum, a Y-shaped enterobiliary anastomosis, and segmental colectomy. Fistulas between the gallbladder and hepatic duct in a 71-yr-old and a 69-yr-old woman, which were masked by cholelithiasis, were treated by cholecystectomy and a Y-shaped anastomosis between the hepatic duct and jejunum. All patients except the one with cancer of the colon survived. Five patients had no complications and were discharged from the hospital 10-21 days after surgery. One patient was given anticoagulants after she developed myocardial ischemia 48 hr after surgery, and three received antibiotics.

6396 CONGENITAL CYSTS OF THE INTRAHEPATIC BILIARY TRACT (CAROLI'S DISEASE). *(Ger.)*

Siedek, M.; Kaufer, C.; Clemens, W.; Stadelmann, O.; Bucheler, E. (Surg. Clin., Univ. Bonn, Germany). *Leber Magen Darm* 4(5):242-246, 1974.

A 32-yr-old man, whose brother had chronic hepatitis, was hospitalized eight times in a 10-yr period for undiagnosed pain in the upper right abdomen. A cholecystectomy, performed for suspected cholecystitis, showed no evidence of stones in the gallbladder; a choledocholithotomy was performed at the same time. The biliary tract was not visualized radiologically. The following year, the patient was hospitalized for cholangitis and pancreatitis and was treated with antibiotics. The next year, he was hospitalized again for colic-like pain in the upper right abdomen. An infusion cholangiogram performed with tomography showed weak contrasting of dilated bile ducts in the liver and a dilated common bile duct with prepapillary stenosis and a suggestion of gallstones. No evidence of tumors or echinococcal cysts was found by radiological examination of the hepatic duct or by splenoportography. Some branches of the hepatic artery and portal vein were compressed, and the configuration of the left branch of the portal vein was atypical. Choledocholithotomy and transduodenal papillotomy were performed after removal of four prepapillary stones. A diagnosis of Caroli's disease was established by transpapillary visualization of multiple cysts in the intrahepatic bile ducts. Histological examination of a liver biopsy showed fibrosis associated with pericholangitis. *Klebsiella*, *Pseudomonas*, and enterococci were cultured from the bile. The patient was given antibiotics after surgery and recovered uneventfully.

6397 CARCINOMA OF THE DUODENAL PAPILLA: BYPASS, WHIPPLE'S PROCEDURE, OR PAPILLECTOMY?

(Ger.) Enderlin, F. (Cantonal Hosp., Basel, Switzerland). *Schweiz. Med. Wochenschr.* 105(18):592-595, 1975.

In a 20-yr period, surgery was performed on 41 patients, aged 47 to 80 yr (mean, 62 yr) with carcinomas of the duodenal papilla. The procedure employed was palliative in 16 cases (12 enterobiliary anastomoses and four biliary fistulas), although only three of these 16 patients had confirmed metastases. The surgical mortality was 30%, and the average survival time was only a few months; 2/3 of the patients died within 1 yr. Four of the 16 had undergone cholecystectomy 1 to 3 months before tumor surgery. Whipple's procedure was performed on 17 patients, four of whom had been previously cholecystectomized; five had confirmed lymph node metastases. In noncholecystectomized patients, the gallbladder was removed as a site of potential inflammation, as was the distal part of the stomach, to prevent the development of ulcers. Of these 17 patients, two underwent surgery within the last month and three are alive 2.7, 5, and 22 yr after surgery. Tumors or metastases resulted in death in 12 cases, but eight of these survived more than 1 yr and three survived more than 2 yr. Papillectomies were performed on three patients with localized tumors and on five elderly patients. Two patients are apparently tumor-free after 4 yr, but two others have died of recurrences.

6398 ULTRASOUND TOMOGRAPHY: A SAFE METHOD FOR THE DIAGNOSIS OF CONGENITAL CYSTS OF THE COMMON BILE DUCT.

(Ger.) Weitzel, D.; Beck, J. D. (Pediatr. Clin., Univ. Mainz, Germany). *Klin. Paediatr.* 186(5):460-464, 1974.

A 5-yr-old girl was suspected of having chronic aggressive hepatitis because of a history, dating back to infancy, of episodes of diarrhea and vomiting which recurred at 4 to 10 week intervals and were accompanied by colic-like pain, slimy, light yellow stools and dark urine. She failed to respond to diet therapy, fructose infusions, and fluocortolone administered over a 3-month period. At admission she had jaundice, hepatomegaly, an increased RBC sedimentation rate, and increased WBC, SGOT, SGPT, bilirubin and α_2-globulin values. Indirect evidence of a space-occupying lesion in the pancreas or hepatic portal was obtained by a barium swallow examination, and a liver scan indicated the lesion was located in the right lower lobe. Findings from celiac angiography were consistent with an avascular tumor, and larparoscopy revealed a full gallbladder, massive dilatation of the common bile duct, and an enlarged liver with gross signs of biliary cirrhosis. Findings obtained with ultrasound tomography B were interpreted as excessive dilatation of the bile duct, enlargement of the gallbladder, enlargement of the intrahepatic bile ducts, and diffuse connective tissue proliferation in the liver. At surgery, the common bile duct was about 12 to 15 cm long and 3-5 cm in diameter and, on gross examination, was closed near the papilla. When this bile duct was punctured, 140 ml of bile were obtained. A choledochoduodenostomy was performed and the patient recovered uneventfully. Pathological laboratory findings normalized within a few weeks. Examination of a biopsy taken from the liver at surgery showed biliary cirrhosis. Ultrasound tomography is recommended as the only technique for diagnosing biliary cysts since it shows the space-occupying lesion and its location directly and confirms the fluid nature of the cyst.

6399 PRIMARY CARCINOMA OF THE GALLBLADDER: REPORT ON 36 CASES.

(Ger.) Von Schoning, G.; Anders, A.; Pludra, J. E. (Steglitz Clin., Free Univ., Berlin, Germany). *Chirurg* 46(1):40-46, 1975.

Primary carcinoma of the gallbladder was diagnosed in 36 of 1228 operations on the biliary tract performed in a 4-yr period (2.9%). These 36 patients consisted of 34 women and two men; all but one were over 50 yr old (mean age 69.2 yr). The most common symptom was pain, present in all but four of these patients; upper abdominal tumors or hepatomegaly were found on palpation in 25 cases. None of the laboratory tests performed (alkaline phosphatase, transaminase, hemoglobin, SBC, RBC sedimentation rate and bilirubin) were diagnostic for carcinoma of the gallbladder. Cholangiography was of little value, because the biliary tract was not visualized in jaundiced patients. Barium swallow only suggested the presence of tumors in the biliary tract if the tumor compressed the duodenum and stomach or if a biliary fistula was present. The diagnosis was not established at surgery in six cases, although an experienced pathologist was able to diagnose carcinoma in three of these cases by gross examination of the tissues removed at surgery. This suggests that frozen sections should be examined during surgery. Histological examinations showed that 27 of the 36 patients had adenocarcinomas; these included seven solid undifferentiated and seven mucus-secreting adenocarcinomas. Of three squamous cell carcinomas, two were keratinized. Undifferentiated solid carcinomas were found in three patients, and no histological information was available for three others. Although surgery is generally palliative (carcinomas of the gallbladder soon invade the liver and then the regional lymph nodes), five patients were asymptomatic for more than 12 months after surgery; one patient had a localized carcinoma of the gallbladder and it was possible to remove regional metastases in the other four cases.

6400 ENDOSCOPIC PAPILLOTOMY. EXPERIMENTAL STUDIES AND INITIAL CLINICAL EXPERIENCE.

(E.) Koch, H.; Classen, M.; Schaffner, O.; Demling, L. (Med. Dep., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Scand. J. Gastroenterol.* 10(4):441-444, 1975.

Experimental studies and initial clinical experience in the use of a high-frequency diathermy probe to perform endoscopic papillotomies are reported. Satisfactory papillotomies were performed on 11 dogs, and on the basis of these results endoscopic papillotomies were carried out in 23 patients. Indications for endoscopic papillotomy included common bile duct calculi in 11 high-risk patients; common bile duct calculi overlooked during bile duct surgery in six patients; recurrent calculi after previous cholecystectomy in three cases; and circumscribed papillary stenosis in three patients. For endoscopic papillotomy, the following procedure was adopted: retrograde contrast medium visualization of the common bile duct, possibly also of the main pancreatic duct; introduction of the papillotomy probe; accurate radiological check of the position of the papillotomy probe; and papillotomy. Papillotomy was successful in all 23 cases. At the endoscopic and radiologic follow-up examination carried out three to five days after papilotomy, no further stones were demonstrable in the bile duct in nine cases, indicating they had been passed spontaneously. In ten cases, the calculi had to be extracted using the Dormia basket or a wire loop. One patient had an attack of pancreatitis and the common bile duct had to be removed surgically. Further complications, in particular the occurrence of massive postoperative bleeding, were not observed. The clinical results show that endoscopic papillotomy carried out with the aid of a high-frequency diathermy probe is feasible in human patients and makes it possible to remove calculi in the common bile duct without opening the abdomen.

6401 DRUG ABSORPTION IN PATIENTS WITH T-TUBE AFTER CHOLECYSTECTOMY.

(E.) Aukee, S.; Venho, V. M. K.; Jussila, J.; Karjalainen, P. (Univ. Cent. Hosp., Kuopio, Finland). *Ann. Clin. Res.* 7(1):42-46, 1975.

The influence of bile flow on gastrointestinal absorption of tetracycline, doxycycline, sulfamethazine, and cycloserine was studied in 13 volunteer patients with T-tubes in their main bile ducts following biliary surgery. Gastroduodenal tubes were installed 1 week after cholecystectomy, and hepatic function and bile flow were evaluated following the i.v. administration of 10 µCi of I^{131} rose-bengal. In one group of patients, 1 g of tetracycline hydrochloride aqueous suspension was then administered via the gastroduodenal tube; the tube was rinsed with water and 0.75 g of sulfamethazine was given as an aqueous solution. In the other group of patients, 0.2 g of doxycycline and 0.5 g of cycloserine were given p.o. In both groups, blood samples were taken before and at various intervals after drug administration. The experiments were repeated three days later, after the T-tube was closed. Liver function did not vary in either group whether the T-tube was open or closed. About 80% of the radioactive tracer was recovered from the bile when the T-tube was open, so most of the bile was diverted outside the intestinal tract. Up to 4 hr after administration, the serum tetracycline levels were lower when the T-tube was open than when it was closed. In one patient, the serum levels were decreased to such an extent that therapeutic serum tetracycline levels could not be achieved. The serum doxycycline levels were fairly high and bile flow did not have any effect on doxycycline absorption. The 24-hr biliary excretion of this drug was only about 15% of the urinary excretion. The absorption of sulfamethazine and cycloserine was not affected by the presence or absence of bile. The results indicate that enterohepatic circulation of doxycycline is not important for the maintenance of its serum levels, that intact bile flow is not essential for the absorption of sulfadimidine, and that with the doses currently used, therapeutic serum levels of tetracycline can be expected even in cases of diminished bile flow.

6402 THE REMOVAL OF RETAINED GALLSTONES FROM THE COMMON BILE DUCT: EXPERIENCE WITH SODIUM CHOLATE INFUSION AND THE BURHENNE CATHETER.

(E.) Britton, D. C.; Gill, B. S.; Taylor, R. M. R.; James, O. (R. Victoria Infirm., Newcastle upon Tyne, England). *Br. J. Surg.* 62(7):520-523, 1975.

The use of cholic acid and the Burhenne catheter in the management of gallstones retained in the common bile duct following biliary surgery was studied in nine patients 3-16 weeks after cholecystectomy and exploration of the common bile duct. In four patients, an i.v. catheter was passed down through the T tube to the junction and a sodium cholate solution was infused at a rate of 30 ml/hr for up to 12 days. In two other subjects the T tube was removed and the Burhenne catheter was passed down the T tube tract and manipulated into the common bile duct; the stones were trapped in a Dormia basket passed through the catheter and removed. Three additional subjects received sodium cholate infusion followed by instrumentation with a Burhenne catheter. Liver function tests and estimations of serum electrolytes and serum amylase were performed daily and cholangiograms were performed at intervals of 4 days. Four of the seven patients treated with cholic acid infusion showed disappearance of the gallstones within 8-12 days. In another subject, one stone disappeared during infusion and a second stone was successfully removed with a Burhenne catheter; in one other patient, sodium cholate infusion was ineffective, but the stone was removed by instrumentation. Two attempts at using a Burhenne catheter alone failed as did one attempt at instrumentation following ineffective sodium cholate treatment. All patients treated with sodium cholate developed diarrhea, often quite severe, and became nauseated and anorexic and vomited intermittently. Biliary peritonitis occurred after use of a Burhenne catheter in one patient and after removal of the T tube in a patient treated with sodium cholate. The successful use of the Burhenne catheter appears to require considerable practice and expertise, and should perhaps be reserved for centers with particular interest in its use.

6403 BILIARY AND URINARY CALCULI: PATHOGENESIS FOLLOWING SMALL BOWEL BYPASS FOR OBESITY.

(E.) Wise, L.; Stein, T. (Washington Univ. Sch. Med., St. Louis, Mo.). *Arch. Surg.* 110(8):1043-1047, 1975.

The pathogenesis of biliary and urinary calculi following small intestine bypass procedures was studied in 93 patients who had undergone jejunoileal bypass procedures for massive exogenous obesity. In each case, 35 cm of the proximal jejunum was anastomosed end-to-end with the terminal portion of the ileum. I.v. cholecystokinin was administered to the fasted subjects and bile was collected in a double-lumen gastroduodenal tube. (^{14}C)Cholate (10 µCi) and (^{14}C)chenodeoxycholate (10 µCi) were then administered i.v. and bile-rich duodenal fluid was collected 3, 24, 48, and 72 hr later. Bile salt synthesis and the bile salt glycine/taurine ratio were determined. Within a mean follow-up period of 17.6 mon, three of the 93 patients developed urinary calculi, four developed gallstones, and one developed both urinary calculi and gallstones. Four of the gallstone patients were asymptomatic and one complained of vague upper abdominal pain, while all of those with urinary stones were hospitalized with typical "ureteric colic." A significant postoperative increase in urinary oxalate excretion was correlated with a significant decrease in urinary volume. The 24-hr preoperative urinary oxalate excretion in the four patients who developed urinary calculi was less than 20 mg, while the postoperative values were 94, 107, 51, and 52 mg/24 hr. The stones in these cases were all calcium oxalate calculi and all patients passed them spontaneously or with the help of retrograde catheter manipulation. The rate of bile salt synthesis increased significantly from 1.6 g/day preoperatively to 4.9 g/day postoperatively, and the bile salt glycine-taurine ratio increased significantly from 4.6 to 6.8. It is suggested that the postbypass increase in the biliary glycine/taurine ratio, with its consequent decrease in the zeta potential of the bile micelles, was at least partially responsible for the increased incidence of cholelithiasis. The pathogenic basis for the increased incidence of urinary calculi was hyperoxaluria, which was probably related to the increased bile salt and glycine synthesis.

6404 THE RATE OF DRUG BIOTRANSFORMATION REACTIONS AND CELLULAR VIABILITY IN THE LIVERS OF PATIENTS WITH BILIARY DISEASES. *(E.)* Hietanen, E.; Auranen, A.; Savvakis, C. (Dep. Physiol. Surg., Univ. Turku, Finland). *Acta Hepatogastroenterol. (Stuttg.)* 22(3):170-175, 1975.

The determine how biliary diseases affect hepatic drug metabolism and cellular viability, the cytochrome P-450 concentration, rate of o-aminophenylglucuronide synthesis, and oxygen consumption were measured in liver slices from 62 female patients with uncomplicated cholelithiasis, chronic cholecystitis, choledocholithiasis without bile duct obstruction, or bile duct obstruction and jaundice. The hepatic cytochrome P-450 concentration was highest in the patients with uncomplicated cholelithiasis, slightly decreased in those with chronic cholecystitis, and decreased by about 20% (compared with the uncomplicated cholelithiasis patients) in the patients with bile duct stones without jaundice. The rate of o-aminophenylglucuronide synthesis was similar in the patients with gallstones, chronic cholecystitis, and choledocholithiasis without jaundice; this rate was significantly higher in the patients with obstructive icterus than in the patients with chronic cholecystitis and was significantly higher than in those with gallstones or choledocholithiasis without obstruction. The oxygen consumption by the liver slices from the patients with obstructive jaundice was higher than that by the liver slices from the other groups. The formation of carbon dioxide did not differ among the four groups. It is suggested that the enhanced rate of glycuronidation was caused by the endogenous induction of increased bilirubin levels or by the accumulation of bile acids in the liver cells. The data suggest that drug hydroxylation and glucuronidation activities are under separate control mechanisms.

6405 THE EFFECT OF SODIUM BENZOATE AND TAUROCHOLIC ACID FEEDING ON HUMAN BILE COMPOSITION. *(E.)* Dennis, C.; Gardner, B.; Patti, J.; Chenouda, M. (Downstate Med. Cent., State Univ. New York, Brooklyn, N. Y.). *Proc. Soc. Exp. Biol. Med.* 148(3):602-605, 1975.

The effect of sodium benzoate and taurocholic acid feeding on bile composition was investigated in four patients who had cholecystectomy for cholesterol gallstones and common bile duct exploration with the insertion of a Baldwin T-tube. To determine if the glycine/taurine conjugation ratio could be reversed under acute conditions, the patients were fed sodium benzoate alone (6 g/day) for two or three days and then in combination with taurocholic acid (3 g/day) for three days. No significant changes were noted in serum alkaline phosphatase, bilirubin or glutamic-oxalacetic transaminase levels during the experiment. The benzoate was incapable of significantly lowering the glycine conjugates in the bile. Taurocholic acid significantly increased the concentration of taurine conjugates and markedly altered the glycine/taurine conjugation ratio. The only consistent results were the increase in taurine conjugates after feeding taurocholic acid. Total bile acids were significantly increased in all patients with a marked fall in glycine/taurine conjugation ratio. A proportional increase in biliary phospholipids and cholesterol was also demonstrated. There was no consistent change in the ratio of cholate to chenodeoxycholate concentration in any of the patients. Three patients demonstrated a slight fall in bile acid excretion which returned to normal due to an increase of taurine conjugated bile acid excretion. The results show that the usual glycine/taurine conjugation ratio of 3 or 4:1 consistently found in humans is the result of a relatively low taurine pool available for conjugation of bile acids and not due to preferential conjugation with glycine.

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See also, 5370, 5380, 5517, 5624, 5631, 5640, 5643, 5646, 5653, 5662, 5674, 5676, 5678, 5701, 5820, 5864, 5873, 5891, 5967, 6034, 6132, 6190, 6323, 6326, 6557.

6476 UNUSUAL FEATURES AND COMPLICATIONS OF BEZOARS IN CHILDREN.

(E.) Harris, V. J.; Hanley, G. (Cook Cty. Child. Hosp., Chicago, Ill.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 123(4): 742-745, 1975.

Detailed case histories are presented for three children with trichobezoars, and four others with bezoars are reported. The children (six girls and one boy) ranged in age from 15 months to 9 yr. A 3 x 3 cm mass was palpable in the left hypochondrium of the abdomen of the first case, a 4-yr-old girl, and another, 1.5 x 2 cm, was palpable in the left umbilical area. Both were smooth, nontender, superficial and mobile. A plain film demonstrated a radiopaque mass within the stomach, and segments were also seen in the jejunum, suggesting intussusception. The specimen (22 x 5 cm) was removed at surgery. Plain roentgenograms of the abdomen demonstrated a mass in the stomach in the second patient (a 15-month-old girl), as well as multiple small bowel fluid areas with an overall appearance suggestive of small bowel obstruction. At surgery a large comma-shaped trichobezoar (80 g) was removed from the stomach and multiple intussusceptions were reduced. An upper gastrointestinal series in the third case (a 6-yr-old girl) showed a large gastric bezoar, and perforations in the posterolateral and superomedial portions of the fundus of the stomach. At surgery a 300 g, foul-smelling trichobezoar was removed from the stomach. In addition, two perforations of the anterior wall of the stomach were found, and a large pelvic abscess was drained. The postoperative course was complicated by pneumonia, and the patient died. All seven patients seen had vomiting and abdominal pain as the most common presenting symptom, although anorexia, nausea, weakness, weight loss and constipation were also commonly seen. One patient unexpectedly passed a bezoar *via* the rectum after a 1-yr history of vomiting. Two of the children were mentally retarded, and the others were in need of psychiatric help.

6477 ASSESSMENT OF SIMPLE METHODS OF MEASURING INTESTINAL TRANSIT TIMES IN CHILDREN WITH GASTROENTERITIS.

(E.) Higgs, R. H.; Ellis-Pegler, R. B.; Lambert, H. P. (St. George's Hosp., London, England). *Gut* 16(6):458-461, 1975.

Intestinal transit times were measured in 11 children (aged 3-21 months) with gastroenteritis using carmine suspension and radioopaque pellets. The 2 methods gave widely divergent results. Sick children, often dehydrated and passing frequent fluid motions, were found by the carmine method to have rapid transit times consistent with the clinical picture (mean 2.5 hr). In contrast, the first pellets were seen over a range of 2-49 hr (mean 16.8 hr), similar to that found in controls without diarrhea. Other methods of measuring pellet transit times confirmed this anomaly. Clearly, the pellet method is unsuitable for use in gastroenteritis. It is suggested that the findings may be explained by sequestration of pellets in a particular area of the bowel such as stomach or cecum, or as an example of streaming of gut contents into solid and liquid phases. Pellets might thus be expected to travel in the slower solid phase. Carmine, as a solid suspension, is usually regarded as a solid phase marker, but the results of this study suggest that in acute gastroenteritis this substance travels with the liquid phase of the gut contents. No clear relation was noted between transit time, percentage dehydration, or the presence of reducing substance in the stool.

6478 SUCROSE IN ORAL THERAPY FOR CHOLERA AND RELATED DIARRHOEAS.

(E.) Nalin, D. R. (Cholera Res. Lab., Dacca, Bangladesh). *Lancet* 1(7922):1400-1402, 1975.

Sucrose was tested as a possible alternative to glucose in p.o. diarrhea therapy in 18 patients (17 men and 1 woman, aged 11-65 yr), including 13 with cholera. Each patient received p.o. sucrose plus electrolytes as a maintenance solution. All received tetracycline (250 mg, p.o., every 6 hr for 4 days) from the start of p.o. maintenance. Fifteen of the patients could be maintained using this solution, but 3 developed massive increases in net fluid losses and increases in plasma specific gravity, necessitating termination of p.o. therapy. It is suggested that these 3 patients may not have been able to hydrolyze sufficient sucrose to yield the amount of glucose needed for adequate absorption; this could account for the presence of sugar in the stool and could be attributed to the type of disaccharidase deficiency reported to occur during and after diarrheal episodes. Of 12 patients tested, all had significant concentrations of stool reducing sugar. These results using sucrose are in striking contrast to results with p.o. glucose-electrolyte solution. However, it is suggested that sucrose-electrolyte solution could be used successfully to treat most patients under emergency conditions, in which i.v. fluid supplies have to be conserved and glucose is not available.

6479 ACETYLSALICYLIC ACID AND GASTROINTESTINAL BLEEDING MEASUREMENT OF BLOOD LOSS USING A MODIFIED RADIOACTIVE CHROMIUM METHOD.

(E.) Arvidsson, B.; Magnusson, B.; Solvell, L.; Magnusson, A. (Radiat. Phys. Dep., Univ. Goteborg, Sweden). *Scand. J. Gastroenterol.* 10:115-160, 1975.

The fecal blood loss caused by a new acetylsalicylic acid preparation containing buffering substances was compared with the bleeding induced by plain acetylsalicylic acid tablets. Blood loss was quantified using a ^{51}Cr-labeling technique. Eighteen healthy male volunteers (aged 26-56 yr) were given one of two different salicylate preparations administered crossover in randomized order during two 7-day periods. One drug was a plain acetylsalicylic acid tablet containing 0.5 g acetylsalicylic acid. The other was a buffered tablet containing 0.5 g acetylsalicylic acid, 1.25 g sodium bicarbonate, and 0.5 g citric acid. The dosage was 1 g acetylsalicylic acid, 3 times/day from day 1-7. Two tablets were taken immediately before breakfast, two immediately before lunch, and two at 1 hr before dinner. The plain acetylsalicylate acid was swallowed whole with half a glass of water. The buffered preparation was first dissolved in the same amount of water. An interval of 3 weeks was allowed between the two different drugs. While receiving plain acetylsalicylic acid, 5 out of 18 subjects bled more than 10 ml daily. Three bled more than 20 ml daily. When receiving buffered acetylsalicylic acid, no subject bled 20 ml or more, and only 3 bled between 10 and 20 ml daily. Thus, a median daily blood loss of 4.6 ml during intake of plain acetylsalicylic acid was decreased to 2.0 ml during intake of the buffered preparation. The findings of this study confirm previous findings that increasing buffering capacity will successively decrease the amount of gastrointestinal blood loss. In this present study highly sensitive measuring equipment was used which made it possible to reduce the amount of ^{51}Cr from 1/3 to 1/10 of the previously used amounts.

6480 SERUM IgE IN EOSINOPHILIC GASTROENTERITIS. RESPONSE TO INTESTINAL CHALLENGE IN TWO CASES. *(E.)* Caldwell, J. H.; Tennenbaum, J. I.; Bronstein, H. A. (Ohio State Univ. Coll. Med., Columbus). *New Engl. J. Med.* 292(26):1388-1390, 1975.

Since serum levels of IgE have found wide application in the *in vitro* assessment of more common forms of allergy, e.g., ragweed sensitivity, a study of serum IgE was carried out in 2 patients with proved eosinophilic gastroenteritis. It was hoped to determine whether serum IgE in these patients correlated with historical evidence of food sensitivity and with results of intradermal testing. A 40-yr-old male had noticed gastrointestinal difficulty occurring within min after the ingestion of specific foods. His history revealed seasonal allergic rhinitis. There had been no correlation between upper-airway and digestive symptoms, and no relief of the latter by antihistamines which he took occasionally. Intradermal skin tests showed 2+ or greater reactions to grasses, ragweed, corn, oats, peas, barley, beef, egg, chicken, lamb, pork, and fish. Small bowel biopsy disclosed eosinophilia of the lamina propria and was otherwise normal. Since discharge he had been successfully treated with small doses of p.o. corticosteroids. Three yr later an assay of a serum sample for specific IgE antibodies by the radioallergosorbent test showed a 1+ score for fish, 2+ for ragweed, grass and corn, and 4+ for egg and wheat. In a second case, a 66-yr-old male was hospitalized because of eosinophilia and several weeks of postprandial diarrhea and abdominal distension. Gastroduodenal endoscopy was carried out, and biopsy showed dense infiltration of the pyloric and proximal duodenal mucosa with eosinophils and an otherwise normal mucosa. Intradermal tests for numerous inhalants and food allergies were negative. Skin tests for mumps and histoplasmin were positive at 48 hr. He was treated with low doses of oral corticosteroids with improvement for a period of 2 yr. Intestinal challenge studies caused the serum IgE levels in the former patient, already markedly elevated in the fasting state, to rise nearly 3-fold within the hr after challenge with food to which he was clinically sensitive. Challenge of the latter patient evoked no symptoms and no change in the normal base-line level of IgE. These data indicate that a mechanism other than classic immediate hypersensitivity was involved in the second patient's illness. In contrast, the first patient appeared to have true IgE-mediated food allergy.

6481 EARLY RECOVERY OF EXOCRINE PANCREATIC FUNCTION IN ADULT PROTEIN-CALORIE MALNUTRITION. *(E.)* Kumar, R.; Banks, P. A.; George, P. K.; Tandon, B. N. (All India Inst. Med. Sci., New Delhi). *Gastroenterology* 68(6):1593-1595, 1975.

The early pattern of recovery of pancreatic exocrine function in response to a high protein diet was studied in 9 patients (6 men and 3 women, aged 20-70 yr) whose dietary histories indicated prolonged intake of food low in calories and deficient in protein. All patients showed symptoms of diarrhea, weakness, and peripheral edema. Pancreozymin-secretin tests were performed. The patients were placed on a diet which provided 50 cal/kg composed of 20% calories from animal protein of high biological value, 55% calories from fat, and 25% calories from carbohydrate. Repeat studies of pancreatic exocrine function were performed at 2 weeks and at 6 weeks after dietary therapy was instituted. The volume of basal and stimulated pancreatic flow was not significantly altered by the high-protein diet. There was significant improvement in the maximal bicarbonate concentration at 2 weeks but no additional improvement at 6 weeks. The maximal bicarbonate concentration of 71.3 mEq/liter at 2 weeks and 76.0 mEq/liter at 6 weeks are still subnormal compared with control volunteers in India. A significant improvement in protease secretion after 2 weeks was sustained but not increased after 6 weeks on the high-protein diet. The results of this study confirm the characteristic secretory deficit in adult protein caloric malnutrition and reveal that there is substantial improvement in pancreatic exocrine function after only 2 weeks of dietary therapy with improvement in maximum bicarbonate concentration and increased protease secretion. This rapid improvement indicates that there is considerable regenerative ability in the pancreas of man despite long-standing severe protein calorie malnutrition.

6482 DIFFERENTIAL MEASUREMENT OF SMALL AND LARGE BOWEL TRANSIT TIMES IN CONSTIPATION AND DIARRHOEA: A NEW APPROACH. *(E.)* Waller, S. L. (Cent. Middlesex Hosp., London, England). *Gut* 16(5):372-378, 1975.

A method which allows the transit time through the small and large intestine to be differentiated was studied in 13 patients. Seven of the patients had diarrhea, which was caused by the irritable bowel syndrome (three), vagotomy and pyloroplasty (three), and laxative abuse (one). Just before breakfast each patient received a radiotelemetering capsule containing a disc of filter paper impregnated with 5 to 10 μCi of ^{51}Cr. After breakfast each was given 25 radioopaque pellets. The position of the capsule was plotted at intervals from zero to 10 and 12 hr daily. Plots were made every 15 to 20 min for the stomach and small intestine and every 30 to 60 min for the colon. Gastric emptying and small intestinal transit were similar in all patients. In contrast, colonic transit was faster in patients with diarrhea (17.5 hr) than in controls (118 hr). Senna was administered to four constipated subjects and produced a transit plot and elimination of the pellets and capsule which resembled diarrheal states in two of the four. In the other two patients, senna caused neither movement of the capsule nor bowel action. One diarrheal subject was restudied while taking codeine phosphate (60 mg over a 6-hr period). Small intestinal transit time was prolonged by only 2 hr, but the capsule remained in the colon an extra 34 hr. It is concluded that this new method allows differential measurement of small and large bowel transit times in man, thus allowing frequent observations of movements of colonic contents to be made without recourse to radiographs. The method is time consuming, but technically simple, avoids intubation, and gives much information with minimal irradiation of the patient. It is concluded that fast colonic transit is a striking feature of diarrhea.

6483 RELATIVE ABUNDANCE OF BIG AND LITTLE GASTRINS IN THE TUMOURS AND BLOOD OF PATIENTS WITH THE ZOLLINGER-ELLISON SYNDROME. *(E.)* Dockray, G. J.; Walsh, J. H.; Passaro, E., Jr. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gut* 16(5):353-358, 1975.

The relative concentrations of big gastrin (G-34) and little gastrin (G-17) were compared in the sera and tumors (gastrinomas) of five Zollinger-Ellison syndrome patients. Big and little gastrins were identified in all ten serum samples and in all ten tumor biopsies examined. In serum, G-34 (range of concentrations, 58 to 220,000 fM/ml) was the major form of gastrin and G-17 (22 to 78,000 fM/ml) was a minor component. The mean relative abundance of G-17 (G17/[G17 + G34]) in serum was 0.18 and the mean relative abundance of G-34 was 0.82. In tumor, however, the opposite was true. G-17 (49 to 869,000 pM/g) was the major component and G-34 (45-464 pM/g) a minor component, and the relative proportions of G-17 and G-34 were 0.73 and 0.27, resp. Following an i.v. injection of porcine secretin (2.0 U/kg), there was a rapid increase in concentration of all forms of gastrin in the blood, but the increase in G-17 was proportionately greater than that of G-34 (relative abundance of G-17 in basal serum was 0.21 compared with 0.37, 5 min after secretin administration). Differences in the half lives of G-17 and G-34 may partly explain their relative abundancy in serum and tumor tissues. It is noted that G-17 is about seven times more potent than G-34 in stimulating acid secretion when potencies are expressed in terms of serum concentration. Thus, although G-17 constituted only about 20% of the serum gastrin immunoreactivity, its contribution to the biological activity in serum was the most important circulating form of gastrin.

6484 KAPOSI'S SARCOMA OF THE STOMACH AND DUODENUM: ENDOSCOPIC AND ROENTGENOLOGIC CORRELATIONS. *(E.)* Ahmed, N.; Nelson, R. S.; Goldstein, H. M.; Sinkovics, J. G. (M. D. Anderson Hosp. Tumor Inst., Houston, Tex.). *Gastrointest. Endosc.* 21(4):149-152, 1975.

To stress the occurrence, clinical presentation and management of gastrointestinal involvement with Kaposi's sarcoma, with particular emphasis on the endoscopic and radiological means of diagnosis and evaluation during treatment, four case reports are presented. Biopsies confirmed the diagnosis of Kaposi's sarcoma in the first case, a 68-yr-old man. Physical examination revealed widespread typical cutaneous lesions, hepatomegaly, diminished peripheral pulses in the lower extremity, and a right pleural effusion yielding Karposi's sarcoma cells on cytological examination. Gastroduodenoscopy showed numerous, purple macular lesions in the body of the stomach, in addition to sessile polypoid lesions (0.5-1.5 cm in diameter). Chemotherapy produced total regression of lesions with only two tiny white polypoid areas in the body of the stomach; the skin lesions remained unchanged after an initial, partial regression. The second case (a 60-yr-old man) showed cutaneous lesions and splenomegaly. Gastroscopy showed several 1 to 2 cm lesions at the junction of the body and the fundus of the stomach, in addition to similar 4 to 5 mm lesions present more distally along the greater curvature. Chemotherapy produced complete regression of the gastric lesions, but produced no response in skin involvement. A double-contrast view of the stomach in the third case (a 77-yr-old man) showed bulbous enlargement of two gastric rugae and a small nodular filling defect along the lesser curvature. An upper gastrointestinal radiograph demonstrated a target lesion of the upper body of the stomach in the fourth case (a 65-yr-old man), composed of a submucosal filling defect with a central collection of barium. Both these patients were treated with chemotherapy, and the outcome awaits further evaluation. The majority of upper gastrointestinal lesions in Kaposi's sarcoma were found in the stomach at endoscopy. There are three distinct types: maculopapular; nodular and polypous; and nodular with central umbilication. It is concluded that the visceral involvement in Kaposi's sarcoma is probably a manifestation of multicentricity rather than metastasis.

6485 EFFECT OF MICROORGANISMS ISOLATED FROM THE UPPER GUT OF MALNOURISHED CHILDREN ON INTESTINAL SUGAR ABSORPTION IN VIVO. *(E.)* Gracey, M.; Burke, V.; Thomas, J. A.; Stone, D. E. (Princess Margaret Children's Medical Res. Foundation, Perth, Western Australia). *Am. J. Clin. Nutr.* 28(8):841-845, 1975.

The effect of excessive numbers of microorganisms, cultured from the duodenum of malnourished children, on the intestinal transport of sugar was investigated. Adult Wistar rats (150-300 g) were used and a 20 cm segment of the jejunum was selected as a test site for the absorption of arbutin (p-hydroxyphenyl-β-glucoside). Several varieties of microorganisms were capable of interfering with absorption of sugar: lactobacillis, all species of *E. coli, Klebsiella, Pseudomonas, C. albicans* and *C. parapsilosis*. Cultures of *Staphylococcus saprophyticus, Salmonella paratyphi, Shigella, Proteus* and *C. tropicalis* did not have an inhibitory effect. Whether the observed effects were due to direct action of the organisms or to a toxin or other metabolic by-product requires further study. The fact that some of the organisms connected with inhibition were not considered enteropathogenic suggests that concepts of enteropathogenicity may require revision.

6486 ENTEROTOXIGENIC Escherichia coli-ASSOCAITED DIARRHEAL DISEASE IN APACHE CHILDREN. *(E.)* Sack, R. B.; Hirschhorn, N.; Brownlee, I.; Cash, R. A.; Woodward, W. E.; Sack, D. A. (Univ. Oregon Med. Sch., Portland). *N. Engl. J. Med.* 292(20):1041-1045, 1975.

A search for intestinal enterotoxigenic *Escherichia coli* was made in 59 Apache children hospitalized with 64 episodes of acute diarrhea. *E. coli* isolated from acute-phase and convalescent-phase specimens of small bowel fluid and stool were tested in three recognized models: the adult rabbit ileal loop, infant rabbit, and the adrenal-cell assay. Enterotoxigenic strains were isolated from ten children during acute diarrheal episodes (16%). None were isolated from convalescent-phase specimens. None of 64 enteropathogenic serotypes of *E. coli* from 43 children with diarrhea, however, caused fluid production in the ileal-loop model. These results suggest that enterotoxigenic *E. coli* may be the cause of considerable diarrhea in this population and that the term "enteropathogenic" as applied to serotypes of *E. coli* needs to be redefined.

6487 CARCINOIDS AND CANCER SUSCEPTIBILITY. *(Fr.)* Giroux, L.; Laurencelle, L.; Lesage, R.; Delorme, F. (Hosp. Notre Dame, Montreal, Canada). *Union Med. Can.* 104(4):596-600, 1975.

6488 PRIMARY GASTRODUODENITIS IN CHILDREN. *(Rus.)* Mazurin, A. V.; Miroshnichenko, V. A.; Barchunova, N. N.; Tsvetkova, L. N.; Galaeva, S. S. (Children's Hosp. No. 3, N. I. Pirogov Second Moscow Med. Inst., USSR). *Vopr. Okhr. Materin. Det.* 20(3):23-28, 1975.

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6490 THE USE OF COLABON (H-4419) IN THE TREATMENT OF INFANTILE DIARRHEA. *(Por.)* Schmidt, B. J.; Bourgeois, B.; Fleury, J.; Filho, O.; Nascimento, J. S.; Nakamura, K. T.; Cardoso, A.; Pereira, J. L.; Gizaai, G. F.; Costa, C. D. (Clin. Pediatr., Fac. Med. Sorocaba, Sao Paulo, Brazil). *Pediatr. Prat.* 45(1-2):11-16, 1974.

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6492 ACUTE HEMORRHAGE OF THE UPPER GASTROINTESTINAL TRACT WITH REGARD TO DRUG-INDUCED LESION OF THE GASTRIC MUCOSA. *(Ger.)* Schwenke, E.; Schwenke, G.; Willgeroth, C. (Med. Clin., Magdeburg-Altstads Dist. Hosp., Germany). *Z. Gesamte Inn. Med.* 30(5):198-205, 1975.

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6508 UPPER GASTROINTESTINAL BLEEDING: CAUSES, DIAGNOSIS AND THERAPY. *(Ger.)* Phillip, J. (Med. Clin. Polyclin., Univ. Erlangen-Nuremberg, Erlangen, Germany). *Fortschr. Med.* 93(7):309-312, 1975.

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6510 COMPARATIVE STUDIES OF ORAL AND SUBCUTANEOUS IMMUNIZATION AGAINST TYPHOID AND PARATYPHOID FEVER. *(Rus.)* Krasnoproshina, L. I. (I. I. Mechnikov Moscow Inst. Vaccines Sera, USSR). *Acta Microbiol. Acad. Sci. Hung.* 21(1-2):151-160, 1974.

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6523 CONCURRENCE OF ULCERATIVE COLITIS AND CHRONIC ACTIVE HEPATITIS. CLINICAL COURSES AND RESULTS OF COLECTOMY. *(E.)* Olsson, R.; Hulton, L. (Dep. Med. II, Sahlgrenska Hosp., Gotherburg, Sweden). *Scand. J. Gastroenterol.* 10(3):331-335, 1975.

6624 FINE STRUCTURE OF THE JEJUNAL ABSORPTIVE CELLS IN THE HUMAN INFANTS WITH PERSISTENT DIARRHEA. *(E.)* Yamamoto, T.; Fujita, M. (Dep. Anat., Univ. Kyushu, Fukuoka, Japan). *Nihon Rynsho Denshi Kenoikyo Gakkai-Shi* 7(3-4):341, 1974.

6525 A CONTROLLED CLINICAL TRIAL OF CHLORAMPHENICOL IN CHLORAMPHENICOL-RESISTANT TYPHOID FEVER. *(E.)* Calderon, E.; Gilman, R. H.; Snyder, M. J.; Vazquez, V.; Barreto, D. G.; Legorrieta, J.; Rodriguez, R.; Martinez, F.; Hornick, R. B. Woodward, T. E. (Hosp. Del Nino, Mexico City, Mexico). *Rev. Lat. Am. Microbiol.* 16(3):131-136, 1974.

6526 DIET AND INTESTINAL ENZYME ADAPTATION: IMPLICATIONS FOR GASTROINTESTINAL DISORDERS. *(E.)* Rosensweig, N. S. (St. Luke's Hosp. Cent., New York, N.Y.). *Am. J. Clin. Nutr.* 28(6):648-655, 1975.

6527 HUMAN IMMUNIZATION WITH KILLED CHOLERA VACCINE. *(E.)* Denchev, V.; Jeleva, M.; Duncheva, S. (Cent. Infect. Parasit. Dis., Sofia, Bulgaria). *Acta Microbiol. Acad. Sci. Hung.* 21(1-2): 209-212, 1974.

6528 IMMUNIZATION OF INFANTS AGAINST Escherichia coli ENTERITIS. *(E.)* Rauss, K.; Ketyl, I.; Szendrei, L.; Vertenyi, A. (Univ. Med. Sch., Pecs, Hungary). *Acta Microbiol. Acad. Sci. Hung.* 21(1-2): 181-185, 1975.

6529 GENERAL IMMUNITY REACTIONS AFTER ORAL ADMINISTRATION OF INACTIVATED TYPHOID VACCINES IN MAN. *(E.)* Karolcek, J.; Draskovicova, M.; Georch, D. (Res. Inst. Epidemiol., Bratislava, Czechoslovakia). *Acta Microbiol. Acad. Sci. Hung.* 21(1-2):143-150, 1975.

6530 ORAL IMMUNIZATION AGAINST DYSENTERY. *(E.)* Ketyi, I.; Rauss, K.; Vertenyi, A. (Univ. Med. Sch., Pecs, Hungary). *Acta Microbiol. Acad. Sci. Hung.* 21(1-2):81-85, 1974.

6531 SUCCESSFUL FIELD TRIALS WITH ORAL KILLED Shigella sonnei VACCINE. *(E.)* Grahneis, H. (Inst. Hygiene Halle Dist., W. Germany). *Acta Microbiol. Acad. Sci. Hung.* 21(1-2):75-80, 1974.

6532 IMMUNITY AGAINST DYSENTERY AFTER ENTERAL IMMUNIZATION WITH LIVE VACCINE. *(E.)* Denchev, V.; Trifonova, A.; Jeleva, M.; Duncheva, S.; Bratanova, V.; Dimitrova, Z.; Kovachev, P. (Cent. Infect. Parasit. Dis., Sofia, Bulgaria). *Acta Microbiol. Acad. Sci. Hung.* 21(1-2);71-74, 1974.

6533 ORAL IMMUNIZATION AGAINST ENTERIC INFECTIONS USING INACTIVATED BACTERIA. A REVIEW. *(E.)* Mochmann, H.; Ocklitz, H. W. (Inst. Inf. Dis. Child., Berlin, E. Germany). *Acta Microbiol. Acad. Sci. Hung.* 21(1-2):3-10, 1974.

6534 DEATH FROM PSEUDOMEMBRANOUS ENTEROCOLITIS. *(E.)* Ledger, W. J.; Puttler, O. L. (Univ. California Med. Cent., Los Angeles). *Obstet. Gynecol.* 45(6):609-613, 1975.

6535 SYNCHRONOUS MALIGNANT MUCOEPIDERMOID TUMOR OF THE PAROTID GLAND AND WARTHIN'S TUMOR IN ADJACENT LYMPH NODE. *(E.)* Lumerman, H.; Freedman, P.; Caracciolo, P.; Remigio, P. S. (Catholic Med. Cent., Brooklyn, N.Y.). *Oral Surg.* 39(6):953-958, 1975.

6536 REOVIRUS-LIKE PARTICLES IN JEJUNAL MUCOSA OF A JAPANESE INFANT WITH ACUTE INFECTIOUS NON-BACTERIAL GASTROENTERITIS. *(E.)* Suzuki, H.; Konno, T. (Tohku Univ. Sch. Med., Sendai, Japan). *Tohoku J. Exp. Med.* 115(3):199-211, 1975.

6537 THE PATHOGENESIS OF SHIGELLA DIARRHEA. V. RELATIONSHIP OF SHIGA ENTEROTOXIN, NEUROTOXIN, AND CYTOTOXIN. *(E.)* Keusch, G. T.; Jacewicz, M. (Mt. Sinai Sch. Med., City Univ. New York, N.Y.). *J. Infect. Dis.* 131:S33-39, 1975.

6538 SALMONELLOSIS IN INFANTS. *(E.)* Rocha, E. (Univ. Hosp., Mustapha, Algiers, Algeria). *Environ. Child Health* 21(113):60-63, 1975.

6539 DIPHENOXYLATE HYDROCHLORIDE (LOMOTIL) IN THE MANAGEMENT OF CHOLERA. *(E.)* De, S.; Sircar, B. K.; De, S. P. (Infect. Dis. Hosp., Calcutta, India). *Indian J. Med. Res.* 63(3):469-474, 1975.

6540 A COMPARATIVE EVALUATION OF THE TREATMENT OF TYPHOID FEVERS WITH CO-TRIMOXAZOLE AND CHLORAMPHENICOL IN EGYPT. *(E.)* Hassan, A.; Hathout, S.; Safwat, Y.; Erian, M.; Abdel Wahab, M. F.; Sorensen, K.; Sippel, J.; Farid, A. (Abbassia Fever Hosp., Cairo, Egypt). *J. Trop. Med.* 78(3):50-53, 1975.

6541 SURGERY IN GASTROINTESTINAL SCLERODERMA. SUBTOTAL COLECTOMY. *(E.)* Wehmeyer, D. L.; Kiser, J. (Wesley Med. Cent., Wichita, Kansas). *J. Kansas Med.* 76(6):129-131, 1975.

6542 ANEURYSM OF THE GASTRODUODENAL ARTERY. *(E.)* Amongero, F.; Edlin, P.; Gottesman, L.; Friedman, E. M.; Posevitz, L. (no affil.). *Angiology* 26(5):424-428, 1975.

6543 THE LIVER AND CARBOHYDRATE METABOLISM IN PROTEIN CALORIE MALNUTRITION. *(E.)* Kassem, A. S.; Hafez, M.; Badr-El-Din, M. K.; Hassan, A. H. I. (Dep. Pediatr., Alexandria, Egypt). *Environ. Child Health* 21(1):3-6, 1975.

See also, 5216, 5593, 5680, 5688, 5685, 5882, 5892, 5904, 6051.

GENERAL

Parasitology

6544 TRYPTIC ACTIVITY IN THE DUODENAL ASPIRATE FOLLOWING A STANDARD TEST MEAL IN GIARDIASIS. *(E.)* Chawla, L. S.; Sehgal, A. K.; Broor, S. L.; Verma, R. S.; Chhuttani, P. N. (Postgraduate Inst. Medical Education Res., Chandigarh, India). *Scand. J. Gastroenterol.* 10(4):445-447, 1975.

Tryptic activity was studied in the duodenal aspirate of giardiasis patients after a standard test meal. The diagnosis of giardiasis was made in 26 patients (17 men and nine women, aged 14-60 yr) by repeated stool examinations. Duodenal juice was collected for two hr after a meal containing 45 g glucose, 18 g soya bean oil, and 15 g dried milk protein powder in 300 ml warm water. Tryptic activity was estimated using synthetic α-N-benzoyl-L-arginine ethyl ester as a substrate. The patients were treated with furazolidine (100 mg/day for 7 days). The mean tryptic activity for 20 normal controls ranged from 12.7-27.5 μEq/min/ml, with the lower limit of normal at 8.9 μEq/min/ml. The mean tryptic activity in the giardiasis group before treatment ranged from 3.4-26.7 μEq/min/ml. There was a highly significant difference between this group and controls. Values below 8.9 μEq/min/ml were found in 10 cases (38.46%), all with diarrhea. A marked rise in tryptic activity was seen in nine patients restudied at least two weeks after completion of therapy, ranging from 10.9-26 μEq/min/ml. The difference in pre- and post-treatment values was highly significant. These data demonstrate a low tryptic activity in giardiasis; however, the mechanisms governing this activity are not clear.

6545 MEBENDAZOLE (R 17635) IN ENTEROBIASIS: A CLINICAL TRIAL IN MENTAL RETARDATES. *(E.)* Lormans, J. A. G.; Wesel, A. J. T.; Vanparus, O. F. (Inst. Ment. Retardates 't Honk, Veldhoven, The Netherlands). *Chemotherapy* 21(3/4):255-260, 1975.

The efficacy of mebendazole against enterobiasis was tested on 150 institutionalized mental retardates (age range, 5-25 yr). At the start of the trial all patients swallowed a tablet containing 100 mg of mebendazole. Another tablet was administered to all patients 2 weeks and 1, 2, and 3 months later. Further treatment with one tablet was given to 19 patients, 4 and 5 months after the start of the trial. The presence of *E. vermicularis* was checked with cellophane adhesive tapes from the anal skin and from the right-hand fingertips before the trial and after 1, 3 and 6 months. Of 150 subjects, 94 were positive before the trial. At the first post-treatment examination, all patients were negative. However, 12% were eventually reinfected. No side effects were observed or reported. These data confirm the efficacy of mebendazole in the treatment of oxyuriasis, and its lack of adverse effects.

6546 WHIPWORM DYSENTERY. *(E.)* McCaffery, T. D.; (Louisiana State Univ. Sch. Med., New Orleans). *Gastrointest. Endosc.* 21(4):172-173, 1975.

A rare case of non-inflammatory bowel disease due to whipworm infection was presented. A black female of 16 yr presented with vomiting and diarrhea of six weeks duration. Physical examination revealed evidence of dehydration. The abdomen was flat, nontender, and negative for palpable masses. Stools were positive for occult blood, and revealed *Trichuris trichiura* ova (450/direct smear) and *Entameba histolytica* trophozoites. Proctoscopy revealed massive numbers of worms attached to a friable mucosa. Colonoscopy to 40 cm revealed minimum disruption of the mucosa proximal to the friable portion, but massive numbers of worms were seen throughout. Hexylresorcinol (0.2%) retention enemas and tetracycline (one g daily for 10 days) gradually reduced egg count to 79/direct smear. *E. histolytica* infection was no longer evident on multiple follow-ups, and the dysentery cleared. No conclusions are drawn.

6547 ALTERATIONS IN NORMAL ESOPHAGEAL MOTILITY IN PATIENTS WITH CHAGAS' DISEASE. *(E.)* Csendes, A.; Strauszer, T.; Uribe, P. (Hosp. J. J. Aguirre, Santiago, Chile). *Am. J. Dig. Dis.* 20(5):437-442, 1975.

Patients with Chagas' disease but with no esophageal involvement were followed-up to determine whether there was progression toward achalasia. Diagnosis of chronic Chagas' disease in the eight patients was based on visceral compromise (megacolon and heart A-V block), positive hemagglutination, and positive complement binding serologic tests. For radiologic examination, 4-6 spot films were taken of the esophagus and esophogastric junction in each case. The maximal internal diameter of the middle third of the esophagus and the esophogastric junction were reviewed independently by two of the authors and expressed in mm. For manometric studies, an assembly of two or three catheters was introduced through the nose or mouth up to the fundus of the stomach, and the sensors were withdrawn in one cm increments. In five patients without heart disease, 2.5 mg betamethylcoline was injected s.c. and a second pull-through was performed after 20-30 min. Relaxation was recorded as 100% when sphincter and fundic pressures were equal, and as 0% when no relaxation occurred. Follow-up after the first study ranged from 24-87 months later. The radiological studies showed no significant change other than an increase in internal esophageal diameter. Resting gastroesophageal sphincter pressure did not change significantly after a mean follow-up of 64 months. Mean sphincter length was 3.20 cm in the first study and 3.05 in the second. There was complete sphincter relaxation in five patients and partial relaxation in one in the first study. In the second study, two additional patients showed partial relaxation. Mean resting intraesophageal pressure was -3.2 mm Hg in the first study and -3.5 mm Hg in the second. Mean peristaltic wave amplitude showed an increase during the second study, but wave duration did not vary. In the first study, 76% of the waves were peristaltic compared to 89% in the second. After injection of betamethylcoline, three patients showed a significant rise in gastroesophageal sphincter pressure; two showed no increase. It is concluded that there is no direct link between the esophageal motility of achalasia and that of Chagas' disease with respect to gastroesophagealsphincter pressure response and betamethylcoline-induced spontaneous activity.

6548 INTESTINAL MALABSORPTION IN ACUTE INFECTION WITH Strongyloides stercoralis.

(E.) O'Brien, W.; (R. Army Med. Coll., London, England). *Trans. R. Soc. Trop. Med. Hyg.* 69(1):69-77, 1975.

An acute malabsorption syndrome, apparently resulting from early *Strongyloides stercoralis* infection, was described. The patients were seven infantry soldiers stationed in Borneo. Of them, six presented with acute diarrhea with liquid stools. The seventh presented with massive eosinophilia and associated respiratory symptoms, but developed diarrhea within four days of admission to the hospital. After admission, all were passing 4-6 loose, foul stools with a frothy appearance daily. One had abdominal colic, three had had a transient rash 2 weeks before the diarrhea, and two had had episodes of coughing, breathlessness and wheezing about the same time. Intestinal function tests showed severe steatorrhea (25-42 g/day) to be present in three cases, and moderate to mild (7.0-13 g/day) in four cases. The D-xylose test was normal, but absorption of vitamin B_{12} with intrinsic factor was subnormal in four (8.5-25%). Barium meal examination showed thickened traverse mucosal folds in two. Jejunal biopsy specimens showed a pattern of "fingers" and/or "leaves" in six, and "leaves" and ridges in one. Microscopically, the ridges showed partial villous atrophy. The villi were swollen and the vascular pattern was indistinct. Intestinal mucosa was edematous in four. In two there was heavy eosinophil infiltration. Two patients were mildly anemic. The patient with partial villous atrophy had a hemoglobin concentration of 11.8/100 ml, the marrow was megaloblastic, and serum folate was 1.6 ng/ml (it was 2-5.9 ng/ml in the other six). All showed considerable eosinophilia (over 20,000/mm^3 in two, and over 6000/mm^3 in another three). Rhabditiform larvae of *S. stercoralis* were found in the stools of one patient and in the duodenal aspirate of a second. Hookworm ova were found in these two and in three other patients. Three were treated with bephenium hydroxynaphthoate with no effect, and one received tetrachlorethylene without effect. All responded well to dithiazanine treatment. In one patient B_{12} malabsorption persisted, but returned to normal after a week of aureomycin therapy. It is concluded that the malabsorption may have been due to a hypersensitive reaction to the worms, with histamine release from intestinal mucosa mast cells.

6549 PRECIPITATING ANTIBODIES AGAINST Entamoeba histolytica IN LIVER PUS: A PRELIMINARY COMMUNICATION.

(E.) Mahajan, R. C.; Ganguly, N. K.; Chitkara, N. L.; Dutta, D. V.; Chhuyyani, P. N. (Postgrad. Inst. Med. Educ. Res., Chandigarh, India). *Indian J. Med. Res.* 63(2):229-231, 1975.

The presence of precipitating antibodies against amebic antigen in liver pus was investigated and its titers were compared with those in serum. Pus samples were obtained from 15 cases of amebic liver abscess. Amebic immunofluorescence and indirect hemagglutination tests were positive in all cases. In each case, 20 ml of aspirate was centrifuged. The resulting supernatant and a serum sample from each patient were tested by counterimmunoelectrophoresis. Of the patients, 11 (73.3%) tested positive for amebiasis (using pus) and 14 (93.3%) tested positive using serum. Antibody titers in the serum specimens (10 were from 1:4 to 1.8) were always higher than those in the pus (nine, neat only; three 1:4). It is concluded that liver pus aspirate can be a diagnostic adjunct in hepatic amebiasis cases.

6550 DETECTION BY IMMUNOFLUORESCENCE OF ANTIBODIES TO PARASITIC AGENTS. USE OF CLASS-SPECIFIC CONJUGATES.

(E.) Huldt, G.; Ljungstrom, I.; Aust-Kettis, A. (Natl. Bacteriol. Lab., Stockholm, Sweden). *Ann. N.Y. Acad. Sci.* 254:304-314, 1975.

Class-specific conjugates were used to study the immunoglobin (Ig) response to parasitic agents in human sera. Sera from patients with toxoplasmosis, trichinosis, South European echinococcosis, and schistosomiasis were examined by immunofluorescence (IF) using class-specific conjugates. The conjugates were also examined for Ig class specificity with *Toxoplasma* antigen, and were tested by IF for direct reactivity with each parasite. Sixteen of the 18 conjugates tested showed Ig class specificity and none reacted directly with any of the parasitic antigens. For each parasite-antibody system, chessboard titrations yielded optimum working dilutions for each conjugate; these titrations gave somewhat different results with the same conjugate in different parasite systems. In 5 infants, congenital toxoplasmosis was diagnosed by the presence of IgM antibodies in the cord blood or serum taken a few days after birth; in these cases IgM was demonstrated over periods of 2-4 months. Conversely, specific IgM antibodies were not detectable in sera taken from 3- to 12-month-old children with the congenital disease. Long-term follow-up studies of patients with acquired toxoplasmosis and trichonosis revealed demonstrable IgM and/or IgA antibodies in the early stage of infection (0-1 month). In toxoplasmosis, the IgA antibodies disappeared before the IgM antibodies, and in both infections, the eventual decrease in specific IgM antibody was associated with a rise in specific IgG antibody titer. Among 103 sera from patients with schistosomiasis, all were positive for IgG antibodies, 34% had IgM antibodies, and 6% had IgA antibodies; many of these patients had little or no clinical symptoms. In serum samples from Scandinavian Lapps with echinococcosis but no demonstrable circulating antibodies, antigenic stimulation was followed by a secondary antibody response to antibodies of the IgM and/or IgA classes. The results indicate that the use of IF for the detection of class-specific immunoglobulin response to parasitic agents can provide a reasonably specific and reproducible test if performed under optimal conditions;

the demonstration of specific IgM and/or IgA antibodies by this test probably indicates recent antigenic stimulation.

6551 COMPARISON OF METRONIDAZOLE AND CHLOROQUINE FOR THE TREATMENT OF AMOEBIC LIVER ABSCESS. A CONTROLLED TRIAL. *(E.)* Cohen, H. G.; Reynolds, T. B. (Univ. South. California Sch. Med., Los Angeles). *Gastroenterology* 69(1):35-41, 1975.

Chloroquine and metronidazole were compared in a randomized trial for the treatment of amebic liver abscess in 36 patients. An additional 30 patients were treated without randomization. The total patient population of 66 individuals was composed of 50 males and 16 females, aged 4 to 74 yr. Chloroquine was administered at a dose level of 500 mg daily for 10 weeks. Metronidazole was given in a dose of 750 mg, 3 times/day for 10 days. Criteria for the diagnosis of amebic abscess included: a suitable clinical picture, filling defect on hepatic scan, high titer of antibody of *Entamoeba histolytica* by indirect hemagglutination, and eventual complete recovery with treatment or appropriate findings on autopsy examination. Treatment failure was defined as illness that persisted beyond 10 days or recurred after that time. Such failure occurred in one out of 28 patients treated with chloroquine and in two out of 36 treated with metronidazole. In two patients who died it was difficult to assess the results of drug therapy. All three failures had unusually large filling defects on scan, and all three showed some improvement with treatment so that pyogenic abscess seemed unlikely. It is concluded that both drugs are highly effective in the treatment of amebic liver abscess.

6552 INTESTINAL NECROSIS OF THE AREA SUPPLIED BY THE SUPERIOR MESENTERIC ARTERY ASSOCIATED WITH COLONIC AND HEPATIC AMEBIASIS. *(Fr.)* Seror, J.; Weill-Bousson, M.; Jaeck, D.; Thomas, M.; Schmitt, J. C.; Korucu, B. (Univ. Hosp. Cent., Strasbourg, France). *Chirurgie* 100(12):884-890, 1974.

6553 KALA AZAR IN ADULTS IN WESTERN FRANCE FOR THE LAST 15 YEARS. *(Fr.)* Hany, Y.; Allannic, H.; Vivien, P. (Pontchaillou Hosp., Rennes, France). *Bull. Soc. Pathol. Exot.* 67(5):503-512, 1974.

6554 EOSINOPHILIC GRANULOMA OF THE COLON CAUSED BY LARVAE OF THE NEMATODE Anisakidae. *(Fr.)* Doby, J. M.; Le Masson, J. M.; Babin, P. (Fac. Med., Rennes, France). *Bull. Soc. Pathol. Exot.* 67(5):522-535, 1974.

6555 A CASE OF PERITONEAL AND PULMONARY SCHISTOSOMIASIS CAUSED BY Schistosoma haematobium. *(Fr.)* Boulay, J.; Pieron, R.; Mafart, Y.; Van Den Akker, M.; Favre, M.; Lancastre, F.; Oustrieres, G.; Andre, J. (Tenon Hosp., Paris, France). *Ann Gastroenterol. Hepatol.* 10(6):475-482, 1974.

6556 LIVER HYDATIDOSIS. EXPERIENCE OF 47 CASES. *(Sp.)* Vilaseca, J.; Vidal Pla, R.; Caralps, A.; Bacardi, R.; Vidal, M. T.; Rius, J. M. (Univ. Barcelona, Fac. Med., Spain). *Rev. Clin. Esp.* 134(3):271-278, 1974.

6557 COMMON BILE DUCT INFECTION WITH Fasciola hepatica: DESCRIPTION OF Fasciola IN HUMANS. *(Ger.)* Anghern, W.; Wegmann, T. (Canton. Hosp., Gallen, Switzerland). *Schweiz. Med. Wochenschr.* 105(22):715-718, 1975.

6558 CLINICAL PROBLEMS WITH AMEBIASIS. *(Ger.)* Stahel, P.; Aeberhard, P.; Pedrinis, E.; Halter, F. (Univ. Clin., Bern, Switzerland). *Schweiz. Med. Wochenschr.* 105(22):709-714, 1975.

6559 LARVAL NEMATODES OF FAMILY ANISAKIDAE (NEMATODA) IN THE NORTHERN SEA OF JAPAN. AS A CAUSATIVE AGENT OF EOSINOPHILIC PHLEGMONE OR GRANULOMA IN THE HUMAN GASTRO-INTESTINAL TRACT. *(E.)* Shiraki, T. (Niigata Univ. Sch. Med., Japan). *Acta Med. Biol.* 22(2):57-98, 1974.

6560 CIRCULATING IMMUNE COMPLEXES IN SCHISTOSOMIASIS DUE TO Shistosoma mansoni. *(E.)* Phillips, T. M.; Draper, C. C. (London Sch. Hygiene Trop. Med., England). *Br. Med. J.* 2(5969):476-477, 1975.

6561 PATHOGENIC MECHANISMS NOT OPERATING IN Eimeria necatrix INFECTIONS. *(E.)* Ryley, J. F. (Imperial Chem. Indust. Ltd., Macclesfield, England). *Z. Parasitenk.* 45(3):269-279, 1975.

6562 HOOKWORM INFECTION AND ANAEMIA. *(E.)* Gilles, H. M. (Liverpool Sch. Trop. Med., England). *Trop. Doct.* 5(2):51-55, 1975.

6563 ULTRASTRUCTURAL LOCALIZATION OF ACID PHOSPHATASE IN Entamoeba histolytica AND Entamoeba Gingivalis. *(E.)* Cho, K. M.; Cha, H. Y.; Soh, C. T. (Inst. Trop. Med., Seoul, Korea). *Yonsei Rep Trop. Med.* 4(1):5-18, 1973.

6564 DISTRIBUTION OF ^{131}I-RISA IN THE INTESTINAL EPITHELIA OF PARASITE INFESTED ANIMALS. *(E.)* Soh, C. T.; Kim, S. J. (Inst. Trop. Med., Yonsei Univ., Seoul, Korea). *Yonsei Rep. Trop. Med.* 4(1): 19-26, 1973.

6565 CHANGES OF INTESTINAL MUCOUS MEMBRANE OF DOG WITH REFERENCE TO THE IMMUNOLOGICAL RESPONSE TO PARASITE INFESTATION. *(E.)* Soh, C. T.; Kim, S. J. (Coll. Med., Yonsei Univ., Seoul, Korea). *Yonsei Rep. Trop. Med.* 4(1):27-36, 1973.

6566 ANTIGENIC COMPARISON OF Entamoeba histolytica STRAINS BY INDIRECT FLUORESCENT ANTIBODY TEST (IFAT). *(E.)* Chung, P. R.; Chang, J. K.; Soh, C. T. (Coll. Med., Yonsei Univ., Seoul, Korea). *Yonsei Rep. Trop. Med.* 4(1):37-40, 1973.

6567 PREVALENCE OF INTESTINAL PARASITES IN ULLUNG-DO ISLAND. *(E.)* Cho, K. M.; Chang, J. K.; Chang, S. J.; Rhee, Y. S. (Inst. Trop. Med., Yonsei Univ., Seoul, Korea). *Yonsei Rep. Trop. Med.* 4(1):50-58, 1973.

6568 CONTROL OF SOIL-TRANSMITTED HELMINTHS IN KOREA. A CASE REPORT. *(E.)* Soh, C. T.; (Inst. Trop. Med., Yonsei Univ., Seoul, Korea). *Yonsei Rep. Trop. Med.* 4(1):102-125, 1973.

6569 THE SYNTHESIS OF SERUM PROTEINS IN MICE INFECTED WITH Schistosoma mansoni. *(E.)* Brown, R. A.; Knight, W. B. (Puerto Rico Nucl. Cent., Caparra Heights Stat., San Juan). *Rev. Lat. Am. Microbiol.* 16(3):169-176, 1974.

6570 INTRABILIARY RUPTURE OF HYDATID CYST OF THE LIVER. (REVIEW OF 16 CASES). *(E.)* Aletras, H.; Katsohis, C.; Aidonopoulos, A. (Dep. Surg., Univ. Thessaloniki, Greece). *Bull. Soc. Int. Chir.* 33(5-6):490-492, 1974.

6571 RECURRENT AMEBIC ABSCESS OF THE LIVER. *(E.)* Jenkinson, S. G.; Hargrove, Jr., M. D. (Louisiana State Univ. Med. Cent., Shreveport). *J. Am. Med. Assoc.* 232(3):277-278, 1975.

6572 COMMON INTESTINAL PARASITIC INFECTIONS IN THE SCHOOL-AGE POPULATION. *(E.)* Allensworth, D. D. (Dep. Allied Health Sci., Kent State Univ., Ohio). *J. Sch. Health* 45(6):331-338, 1975.

6573 THE EPIDEMIOLOGY OF COMMON INTESTINAL HELMINTHS. *(E.)* Most, H. (Coll. Med., New York Univ., N.Y.). *J. Sch. Health* 45(6):343-345, 1975.

6574 TREATMENT OF INTESTINAL ROUNDWORM INFECTIONS. *(E.)* Shookhoff, H. B. (Dep. Health, New York, N.Y.). *J. Sch. Health* 45(6):339-342, 1975.

6575 ACUTE AMOEBIC NECROSIS OF BOWEL. *(E.)* Sharma, B. D.; Chooramani, S.; Agarwal, A. K. (S. N. Med. Coll., Agra, India). *Am. J. Proctol.* 26(3):57-62, 1975.

6576 ANTIBIOTIC G-418, A NEW Micromonospora-PRODUCED AMINOGLYCOSIDE WITH ACTIVITY AGAINST PROTOZOA AND HELMINTHS: ANTIPARASITIC ACTIVITY. *(E.)* Loebenberg, D.; Counelis, M.; Waitz, J. A. (Schering Corp., Chemother. Dep., Bloomfield, N.J.). *Antimicrob. Agents Chemother.* 7(6):811-815, 1975.

See also, 5235, 5677, 5983, 6007, 6158.

GENERAL

Regional Enteritis

6577 CROHN'S DISEASE OF THE APPENDIX. PRESENTATION OF A CASE WITH REVIEW OF THE LITERATURE. *(E.)* Weiss, Y.; Durst, A. L. (Cent. Emek Hosp., Afula, Israel). *Am. J. Gastroenterol.* 63(4):333-339, 1975.

An obese 26-yr-old male was admitted as an emergency case with a 6-day history of lower abdominal pain, which irradiated into both flanks and was initially mild. On the fifth day, the pain suddenly increased and his temperature rose to 39.9 C. On admission the patient showed marked direct and rebound tenderness in the right lower quadrant with muscle guarding. An ill-defined mass was palpated in the right iliac fossa. Diagnosis of acute appendicitis was made. At operation a large retrocecal mass was found very close to the right common iliac artery. The mass contained the gangrenous appendix and pus. The appendix was removed without burying the stump and a Penrose drain was left in the abscess cavity. The terminal ileum showed no pathological changes. On the basis of this case and many cited from the literature it is concluded that a surgeon should not hesitate to remove the appendix in the presence of regional enteritis for two reasons. First, the appendix may become the site of Crohn's disease, and second, patients with Crohn's disease may occasionally develop acute appendicitis. Indeed, all cases of Crohn's disease of the appendix showed acute appendicitis superimposed on the granulomatous lesion. Since in a patient with known Crohn's disease, the clinical picture may be interpreted as an acute exacerbation of the basic disease, one may be tempted to procrastinate, thus exposing the patient to possible complications.

6578 METRONIDAZOLE FOR CROHN'S DISEASE. *(E.)* Ursing, B.; Kamme, C. (Univ. Hosp., Lund, Sweden). *Lancet* 1(7910):775-777, 1975.

The use of metronidazole in the treatment of Crohn's disease was investigated in 5 patients (2 men and 3 women, aged 8-26 yr) who differed in respect to duration of disease (4 months to 10 yr), symptoms (diarrhea, abdominal pain, fever, anorexia, weight loss, and sideropenic anemia), and intestinal involvement. The response to metronidazole was the same in 4 of the 5 patients. The patients received a high dose of metronidazole (up to 40 mg/kg/day) which was later reduced to about 30 mg/kg/day. Even though they received the same doses, serum metronidazole levels varied considerably from one patient to another, ranging from 5-35 µg/ml at 2-3 hr after administration of metronidazole to 2-20 µg/ml at 8 hr after drug administration. The drug-related symptoms of nausea, vertigo, and tiredness developed in all patients. Two patients developed paresthesia and hyperesthesia. Neurological examinations showed no abnormalities. Liver function tests and blood picture were normal. All side effects ceased after reduction of the dose. In response to the drug, abdominal pain diminished and defecation became less frequent. The patients gained weight and tolerated a normal diet. In one case, withdrawal of the drug caused a return of symptoms which again disappeared on reinstitution of metronidazole. In one patient, the response to metronidazole was obscure: no improvement was noted until 4 months of metronidazole treatment, and corticosteroids were reintroduced. This patient had higher serum metronidazole levels than those who showed a rapid improvement on the same dose. The response to this drug suggests that anaerobes are involved in the pathogenesis of Crohn's disease. The return to normal of the serum proteins suggested that treatment suppressed the inflammatory processes of the intestines. Of an additional 12 patients, most of them on about 20 mg/kg/day, 9 have shown a rapid clinical improvement, indicating that lower doses than those used in this study may be successful.

6579 CLINICAL MANIFESTATIONS OF CROHN'S DISEASE IN CHILDREN AND ADOLESCENTS. *(E.)* Burbige, E. J.; Huang, S. S.; Bayless, T. M. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Pediatrics* 55(6):866-871, 1975.

The clinical features of 58 patients (37 boys and 21 girls younger than 15 yr of age) with Crohn's disease of the small intestine and/or of the colon are summarized with emphasis on the prominence of extraintestinal manifestations. Nine patients had familial incidence of Crohn's disease or ulcerative colitis. The sites of involvement for these patients included: ileum, 18; ileum-right colon, 12; jejunum-ileum, nine; colon only, eight; duodenum-jejunum-ileum, five; jejunun-ileum-right colon, one; ileum-left colon, one; duodenum, one; and acute ileitis, three. Clinical manifestations included: abdominal pain, 86%; fever, 83%; diarrhea, 72%; growth retardation, 30%; joints, 25%; anorectal disease, 24%; bleeding, 14%; and rash, erythema nodosum, 10%. The average delay in obtaining the correct diagnosis was 13.7 months and ranged from 1 month to 7 yr. The site of the bowel involved was related to the length of the delay. Laboratory results included: increased ESR, 84%; increased WBC, 70%; decreased serum albumin, 64%; hypochromic anemia, 50%; and gastrointestinal blood loss, 36%. The results suggest that the symptoms and signs of Crohn's disease in children are often subtle and generally nonspecific. Crohn's disease should be considered a differential diagnosis of children with prolonged fever or arthralgia even without obvious gastrointestinal complaints. Of the 58 children in this study, 22 were originally thought to have diseases outside the gastrointestinal tract. Proctosigmoidoscopy, barium enema, and small-bowel series are the most useful diagnostic procedures. It is felt that an awareness of the manifestations of Crohn's disease in children as well as a high index of suspicion should shorten the delay before this diagnosis is established.

6580 LEUKOCYTE MIGRATION TEST IN CROHN'S DISEASE, ULCERATIVE COLITIS, AND ANKYLOSING SPONDYLITIS USING CROHN'S COLON HOMOGENATE, MITOCHONDRIAL, AND MICROSOMAL FRACTIONS. *(E.)* Williams, M. J.; Richens, E. R.; Gough, K. R.; Ancill, R. J. (R. United Hosp., Bath, England). *Am. J. Dig. Dis.* 20(5):425-429, 1975.

Leukocytes from 33 patients with Crohn's disease (20 females and 13 males, aged 16-66 yr), 20 patients with ulcerative colitis (15 females and 5 males, aged 16-71 yr) and 20 patients with ankylosing spondylitis (six females and 14 males, aged 16-53 yr) were tested for evidence of abnormal migration in the presence of preparations of colon from a patient with Crohn's disease. In the 33 patients with Crohn's disease, the disease was confined to the large bowel in nine, the small bowel in eight, and involved both large and small intestines in 16. None of the patients studied was undergoing treatment with immunosuppressive drugs. The same test was later performed with leukocytes from 12 healthy controls. Antigen preparations used were colon mucosal homogenate, and colon mucosal mitochondrial and microsomal fractions. The results of this study indicate that a high proportion of Crohn's disease patients have circulating lymphocytes sensitized to constituents of the diseased colonic mucosa. There are also similarities of cellular immunity between Crohn's disease and ulcerative colitis. Lymphocytes from patients with both diseases showed equal cytotoxicity to autologous and allogeneic colon cells. This phenomenon is most marked when the antigens used are the mitochondrial and microsomal fractions of the colonic mucosa. In the ulcerative colitis group, however, there was no evidence of cellular hypersensitivity to these subcellular fractions, and only minimal hypersensitivity to colonic mucosal homogenate. Therefore, this test seems to differentiate between the two diseases. Of the patients with ankylosing spondylitis, one also had Crohn's disease. With each of the three antigens used, a high percentage of patients showed stimulation of leukocyte migration. It is suggested that this may reflect weak sensitization to the antigens as opposed to the strong sensitization manifested by inhibition obtained in the Crohn's disease group. These facts may represent the opposite ends of a hypersensitivity spectrum to an antigen of common significance in the etiology or perpetuation of the disease.

6581 SOME SERUM PROTEIN STUDIES IN CROHN'S DISEASE AND ULCERATIVE COLITIS. *(E.)* Sandor, G.; Levy, E.; Malafosse, M.; Huguet, C.; Huguier, M.; Loygue, J. (Pasteur Inst., Paris, France). *Res. Commun. Chem. Pathol. Pharmacol.* 11(1):129-145, 1975.

In studying the pathogenetic factors involved in the clinical picture for Crohn's disease and ulcerative colitis, 81 determinations were carried out on about 60 cases of Crohn's disease and 73 determinations on about 50 cases of ulcerative colitis. Nine individual serum proteins were evaluated by the immunochemical radial diffusion technique: albumin, transferrin, orosomucoid, ceruloplasmin, beta-1-C-globulin, alpha-2-M-globulin, IgG, IgM and IgA. An increase in IgA, isolated or associated with that of IgM, indicated Crohn's disease; an isolated increase in IgM indicated ulcerative colitis. A significantly increased ceruloplasmin level indicated Crohn's disease; no significant immunoglobulin increase indicated ulcerative colitis. When at least two of the three major immunoglobulins increased, Crohn's disease was indicated; significantly diminished alpha-2-M-globulin indicated ulcerative colitis. An absolute albumin value of less than 20% of normal indicated Crohn's disease. When orosomucoid was highly elevated and albumin was strikingly decreased, both enterites were in acutely evolutive states. The data do not favor the hypothesis of an autoimmune origin, especially for ulcerative colitis. A prevailing IgA synthesis took place in Crohn's disease in which a mostly healthy epithelium is kept intact, but IgM synthesis prevails in ulcerative colitis, in which the mucosal epithelium is broadly destroyed. The data support the theory of a virus as the causative agent for Crohn's disease and ulcerative colitis.

6582 ORAL MANIFESTATIONS OF CROHN'S DISEASE. *(E.)* Basu, M. K.; Asquith, P.; Thompson, R. A.; Cooke, W. T. (Dep. Oral Pathol., Birmingham Univ., England). *Gut* 16(4):249-254, 1975.

The incidence of oral lesions in 100 patients with Crohn's disease (38 men and 62 women) was compared to the incidence in 100 controls and in 100 patients with ulcerative colitis (42 men and 58 women). Of these 300 individuals, nine persons with Crohn's disease (six females and three males, aged 21 to 72 yr), two with ulcerative colitis, and one normal control had oral lesions. Of the Crohn's disease patients with oral lesions, eight had involvement of both the small and large intestine. Perianal disease was found in six, and one had an eczematous skin lesion. The oral lesions macroscopically and histologically resembled those seen in the gastrointestinal tract in Crohn's disease, suggesting they were due to the same disease process. However, typical sarcoid-like granulomas were not seen. Lesions in ulcerative colitis were different macroscopically and histologically. There were no significant differences in the mean values or the incidence of low levels for serum folate, B_{12}, or serum iron between Crohn's disease patients with or without oral lesions. In contrast, an increased number of patients with oral lesions had raised serum seromucoid levels and low serum albumin levels. The parotid secretion rates of IgA for healthy controls and Crohn's patients did not differ significantly. However, Crohn's patients with raised serum seromucoid and low serum albumin had significantly lower IgA secretion rates. It is suggested that in patients with active Crohn's disease, IgA plasma cells destined for the parotid gland are diverted to the site of maximum antigenic stimulation in the bowel. Then the relative lack of IgA in the mouth of such patients allows invasion of the oral mucous membrane by food or bacterial antigens in the mouth, so producing an oral lesion.

6583 A CASE OF "MILIARY" CROHN'S DISEASE. *(Ger.)* Otto, H. F.; Gebbers, J. O.; Kugler, S. (Pathol. Inst., Univ. Hamburg, Germany). *Dtsch. Med. Wochenschr.* 100(11):505-508, 1975.

6584 FAMILIAL FORMS OF CROHN'S DISEASE. *(Fr.)* Duffaut, M.; Le Tallec, Y.; Gadrat, J.; Fournie, A.; Amigues, H.; Blanc, M.; Abbal, M.; Oksman, F. (Purpan Hosp., Toulouse, France). *Cah. Med.* 15(6):305-310, 1974.

6585 ROUNDTABLE DISCUSSION: THE DIFFERENTIAL THERAPY OF CHRONIC INFLAMMATORY DISEASES OF THE LARGE INTESTINE. *(Ger.)* Demling, L.; Fahrlander, H.; Freyberger, H.; Kuhn, H. H.; Kummerle, F. (Med. Clin., Univ. Marburg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:328-329, 1974.

6586 A COMBINED TEST FOR THE DIAGNOSIS OF DISORDERS IN GASTROINTESTINAL PHYSIOLOGY IN REGIONAL ENTERITIS. *(Ger.)* Fromm, H.; Schindler, D.; Bar, U. (Med. Coll., Hanover, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:554-556, 1974.

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6588 DIFFERENCES IN THE TREATMENT OF CROHN'S DISEASE. *(Ger.)* Morl, M. (Med. Clin., Univ. Erlangen, Germany). *Munch. Med. Wochenschr.* 117(15):639-642, 1975.

6589 TREATMENT OF CROHN'S DISEASE WITH A BALANCED, SYNTHETIC, RESIDUE-FREE DIET (VIVASORB). *(Ger.)* Koch, H.; Belohlavek, D.; Berg, G. (Med. Clin., Univ. Erlangen, Germany). *Munch. Med. Wochenschr.* 117(15):643-645, 1975.

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6591 CROHN'S DISEASE AND MALIGNANT TRANSFORMATION. *(Fr.)* Chevrel, B. (St. Antoine Hosp., Paris, France). *Med. Chir. Dig.* 3(6):431-436, 1974.

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6593 PSEUDO-ILEOVESICAL FISTULA IN CROHN DISEASE. *(E.)* Panitch, N. M.; Henn, R. M.; Tetrud, J. W. (Harbor Gen. Hosp., Torrance, Calif.). *JAMA* 232(7):732-733, 1975.

See also, 5881, 5934, 5956, 6505.

NUMBERS FOLLOWED BY AN ASTERISK INDICATE ABSTRACTS. OTHER NUMBERS REFER TO CITATIONS.

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GASTROENTEROLOGY

ABSTRACTS
AND
CITATIONS

ATIONAL INSTITUTE OF ARTHRITIS, METABOLISM, AND DIGESTIVE DISEASES

.S. DEPARTMENT OF
EALTH, EDUCATION, AND WELFARE
ublic Health Service
ational Institutes of Health

NOVEMBER 1975

VOLUME 9, NO. 11

6594—8002

Volume 9 No. 11 Abstract and Citation Nos. 6594–8002

GASTROENTEROLOGY ABSTRACTS AND CITATIONS

A monthly publication of the
National Institute of Arthritis, Metabolism, and Digestive Diseases

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The Franklin Institute Research Laboratories
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Bruce H. Kleinstein, Ph.D., Technical Editor
for the
National Institute of Arthritis, Metabolism, and Digestive Diseases
pursuant to Contract Number NO1-AM-4-2204

with the PHS, USDHEW

DHEW Publication No. (NIH) 76-66

PREFACE

GASTROENTEROLOGY ABSTRACTS and CITATIONS is a publication of the National Institute of Arthritis, Metabolism and Digestive Diseases. This specialized information medium has been initiated to fill an existing great need in the field of gastroenterology and to assist the Institute in meeting its obligations to foster and support laboratory and clinical research into the nature, causes, and therapy of diseases of the gastrointestinal tract. Publication GASTROENTEROLOGY ABSTRACTS and CITATIONS makes available citations of all current papers relevant to this field from medical journals published throughout the world. Approximately one-third of the citations dealing with the major aspects of gastroenterology have accompanying abstracts.

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The Secretary of the Department of Health, Education, and Welfare has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through April 30, 1975.

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NOTE

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LANGUAGE ABBREVIATIONS

Afr.	Afrikaans
Ar.	Arabic
Bul.	Bulgarian
Ch.	Chinese
Cz.	Czech
Dan.	Danish
Dut.	Dutch
E.	English
Eston.	Estonian
Fin.	Finnish
Fl.	Flemish
Fr.	French
Ger.	German
Gr.	Greek
Heb.	Hebrew
Hun.	Hungarian
Ic.	Icelandic
In.	Indonesian
It.	Italian
Jap.	Japanese
Kor.	Korean
Latv.	Latvian
Lith.	Lithuanian
Nor.	Norwegian
Pol.	Polish
Por.	Portuguese
Rum.	Rumanian
Rus.	Russian
Ser.	Serbo-Croatian
Sl.	Slovak
Sp.	Spanish
Sw.	Swedish
Th.	Thai
Turk.	Turkish
Uk.	Ukrainian
Viet.	Vietnamese

ABBREVIATIONS USED IN ABSTRACTS

ACTH	adrenocorticotropic hormone
ADP	adenosine diphosphate
AMP	adenosine monophosphate
amp	ampere
ATP	adenosine triphosphate
Å	angstrom
BSP	sulfobromophthalein
C	degrees centigrade
cal	calories
cc	cubic centimeter
cm	centimeter(s)
dl	deciliter
DNA	deoxyribonucleic acid
ED_{50}	median effective dose(s)
EDTA	ethylenediamine tetraacetic acid
e.g.	for example
EEG	electroencephalogram
ESR	erythrocyte sedimentation rate
g	gram(s)
µg	microgram(s)
Hz	Herz
hr	hour(s)
i.m.	intramuscular
i.p.	intraperitoneal
IU	international unit(s)
i.v.	intravenous
kcal	kilocalorie(s)
kg	kilogram(s)
K_m	Michaelis constant
LD_{50}	median lethal dose(s)
LDH	lactic acid dehydrogenase
m	meter(s)
M	molar; mole(s)
mM	millimolar; millimole(s)
µM	micromolar; micromole(s)
ma	milliampere(s)
mCi, µCi	milli-, microcurie(s)
mEq	milliequivalent(s)
mg	milligram(s)
ml, µl	milli-, microliter(s)
mm	millimeter(s)
mOsm	milliosmolar; milliosmeter(s)
msec	millisecond(s)
mV	millivolt(s)
min	minute(s)
MTD	maximum tolerated dose
NAD	nicotanamide adenine dinucleotide
NADH	reduced nicotanamide adenine dinucleotide
NADP	nicotanamide adenine dinucleotidephosphate
NAPH	reduced nicotanamide adenine dinucleotidephosphate
ng	nanogram (10^{-9})
nm	nanometer(s)
Pa	ambient pressure
PAS	periodic acid — Schiff
pg	picogram (10^{-12})
pgEq	picogram equivalent(s)
p.o.	orally
ppb	parts per billion
ppm	parts per million
r	Roentgen
RBC	red blood cells (erythrocytes), red blood count
resp.	respectively
RNA	ribonucleic acid
s.c.	subcutaneous
sec	second(s)
SGOT	serum glutamic-oxalacetic transaminase
SGPT	serum glutamic-pyruvic transaminase
U	unit(s)
UV	ultraviolet
V	volt
WBC	white blood cells (leukocytes), white blood count
yr	year(s)

PRE-CLINICAL SCIENCES

MORPHOLOGY, CELLULAR STRUCTURE AND HISTOCHEMISTRY

6594 ENDOCRINE CELLS OF THE INTESTINAL MUCOSA. II. NON-ARGENTAFFIN CELLS. *(Pol.)* Lamprecht, J. (Inst. Cell Pathophysiol., CMKP, Warsaw, Poland). *Patol. Pol.* 25(4):595-602, 1974.

Identification and characterization of endocrine cells (EC) of the intestinal mucosa, as well as their functional correlation with intestinal hormones presumably generated by them, was studied directly by electron microscopy and indirectly from other sources. The group of cells in question, morphologically and functionally different from other types of endocrine cells of the intestinal mucosa (especially those of EC cells), designated as nonargentaffin cells, include at least seven individual types of endocrine cells identified by electron microscopy (by the author), or by some other methods (by other researchers): type S (found mostly in duodenum); type EG (in rectum); type I (in duodenum); D (in stomach); D_1 (in duodenum); A-like (in stomach); and T (in duodenum). So far, only two different hormones could be associated with certainty with individual types of nonargentaffin cells as their sources of generation: secretin--with cell type S; and enteroglucagon--with cell type EG. To pursue further the investigation of correlation between specific nonargentaffin cells and individual intestinal hormones, the author recommends the intensification of immunological studies at the electron-microscopic level.

6595 AN UNUSUAL MODIFICATION OF ENDOPLASMIC RETICULUM IN EPITHELIAL CELLS OF THE MOUSE ASCENDING COLON. *(E.)* Michaels, J. E. (Dep. Anatomy, McGill Univ., Montreal, Quebec, Canada). *Anat. Rec.* 183(1):27-38, 1975.

A rarely occurring modification of the endoplasmic reticulum in the epithelium of the ascending colon of the mouse was studied in outbred adult male CD-1 animals. The mice were perfused through the descending thoracic aorta with fixative, after which the colonic tissue was sectioned and observed under a Siemens Elmiskop 1A microscope. The modified endoplasmic reticulum consisted of a stack of 3 to 15 parallel cisterna-like elements separated by regular intervals of about 67 nm. The stacked cisternae were usually located adjacent to the basal end of the nucleus or in the region between the nucleus and the basal cell membrane. The top and bottom cisternae of many of of the stacks had patent lumens and their outer membranes were lined by ribosomes. Although the middle cisternae most frequently had attenuated lumens in their central regions, in some instances the width of the cisternal lumens was similar throughout. Closely apposed pairs of cisternae were also observed, and some of the stacks had a concentric configuration. The intercisternal space contained tightly packed vesicles about 38 nm in diameter which were arranged in a hexagonal pattern. Many of the vesicles were connected to the membranes of the cisternae by stalk-like projections, but the vesicles also occurred between the nuclear envelope and the adjacent parallel cisternae. Mitochondria were situated close to each stack. The vesiculated stacked cisternae appeared to be distinct from the annulate lamellae in several respects, although it is likely that some of the previously reported neuronal lamellar structures are closely related or identical to the vesiculated stacked cisternae. It is highly unlikely that these cisternae are mere artifacts despite their infrequent occurrence.

6596 IMMUNOCHEMICAL STUDIES OF THE ENDOCRINE CELLS OF THE GASTROINTESTINAL TRACT. I. THE USE AND VALUE OF PEROXIDASE-CONJUGATED ANTIBODY TECHNIQUES FOR THE LOCALIZATION OF GASTRIN-CONTAINING CELLS IN THE HUMAN PYLORIC ANTRUM. *(E.)* Robinson, G.; Dawson, I. (Dept. Pathology, Univ. Nottingham, England). *Histochem. J.* 7(4):321-333, 1975.

Light microscopic and immunochemical localization of gastrin-containing cells in cryostat sections of human pyloric antrum were reported. Parallel electron microscope studies were also carried out. Specimens of grossly normal antral mucosa were obtained from patients after pyloroplasty for duodenal ulcer or gastrectomy. All samples were either fresh-frozen or pre-fixed in 4% formaldehyde. The immunological reagents included: rabbit anti-human gastrin serum, glutaraldehyde-activated horseradish peroxidase and peroxidase-conjugated swine anti-rabbit IgG. Cryostat sections were single- or double-stained using direct or indirect techniques. No gastrin-containing cells were localized in fresh-frozen, postfixed tissue, or in unfixed fresh-frozen sections. Staining of sections from paraformaldehyde-fixed blocks by direct and indirect single stain methods using 3,3'-diaminobenzidine tetrahydrochloride (DAB) as a substrate showed the presence of gastrin-containing cells in the antral mucosal glands. Many cells containing either endogenous peroxidase or heme derivatives were also intensely stained by DAB. Preincubation of sections in 0.1 M sodium azide, potassium cyanide, sodium nitroferrocyanide or 3-amino-1,2,4-triazole inhibited endogenous peroxidase activity in the cytoplasmic components of antral mucosal cells, but the macrophages, neutrophils, eosinophils and erythrocytes still stained after DAB treatment. Gastrin-containing cells in prefixed cryostat sections were also demonstrated by both the direct and indirect double-staining techniques. These cells stained a different color from those containing endogeneous peroxidase or substances giving a pseudoperoxidase reaction. No gastrin-containing cells were stained in control sections. The distribution and variation in shape exhibited by the gastrin-containing cells localized by these immunoperoxidase methods were similar to those previously found using immunofluorescent techniques. The methods used in this study, providing a permanent preparation which can be examined under normal bright field illumination, are suggested as useful alternatives to fluorescent methods.

6597 CELL POPULATION KINETICS IN THE MOUSE JEJUNAL CRYPT. *(Eng.)* Al-Dewachi, H. S.; Wright, N. A.; Appleton, D. R.; Watson, A. J. (Dept. Pathology and Medical Statistics, Univ. Newcastle upon Tyne, Newcastle upon Tyne, NE1 4LP, England). *Virchows Arch.* [*Zellpathol.*] 18(3):225-242, 1975.

Kinetics of jejunal crypt cells were studied in 3-mo-old male Balb/c mice using tritiated thymidine (^{3}HTdR) labeling techniques in association with stathmokinetic studies with vincristine. Time parameters were determined by FLM experiment; 49 mice were injected i.p. with ^{3}HTdR, 1 μCi/g, and were killed thereafter. The mean cell cycle time (T_c) was 12.42 hr and the duration of DNA synthesis was 7.61 hr. A T_c of 11.9 hr was observed with a stathmokinetic technique using vincristine. The growth fraction, 0.61, calculated from cycle parameters and from the labeling index was compared to a value of 0.65 estimated from a labeling distribution curve. The mitotic duration was found to vary with cell population. The duration of mitosis for a whole crypt was 0.86 hr, between 0.8 and 1.2 hr for the proliferative compartment and somewhat shorter for basal cell positions. Apparent T_c were longest in the basal cell positions. The crypt migration rate, calculated from a cumulative birth rate curve, was 1.48 cell positions/hr, compared with 1.8 cell positions/hr as measured from movement of the 50% peak value on the labeling index distribution curve with time after ^{3}HTdr treatment. The crypt cell production rate, calculated from microdissected, squashed crypts, was 14 cells/crypt/hr. The total crypt population was 282 cells, of which 175 were proliferative. In some instances, the experimental results were compared with values previously published for mouse jejunal crypt cells.

6598 CELL POPULATION KINETICS IN THE RAT JEJUNAL CRYPT. *(Eng.)* Wright, N. A.; Al-Dewachi, H. S.; Appleton, D. R.; Watson, A. J. (Dept. Pathology and Medical Statistics, Univ. Newcastle upon Tyne, Newcastle upon Tyne, England). *Cell Tissue Kinet.* 8(4):361-368, 1975.

Autoradiographic techniques with tritiated thymidine (i.p. injection of 0.5 μCi/g) and a stathmokinetic technique with vincristine were employed to study the cell kinetics (including crypt cell production rate) in the jejunal crypt of 3-mo-old male Wistar rats. The migration rate of the 50% peak on the labeling index distribution curve 9 hr after administration of tritiated thymidine was 1.43 cell positions/hr. This was compared with the maximum value reached from a cumulative birth rate curve of 1.78 positions/hr. The product of the mean number of cells in the crypt column, 32.9, and in the column count (measurement made by counting ≅ 100 circular crypt cross sections), 22.3, gave an estimate of the total crypt population of 734 cells/crypt, compared with 650 estimated from direct observation of squashed, microdissected crypts. The mean number of mitoses/crypt was 22.5. The crypt cell production rate was 32 cells/hr; this value was confirmed by two independent techniques. The crypt growth fraction, calculated from the duration of phases of the cell cycle and the labeling index, was 0.62 compared to 0.61 found from the labeling index distribution curve. As assessed from crypt squashes, there were 402 proliferating cells/crypt.

6599 CELL SURFACE IMMUNOGLOBULIN. XIV. SYNTHESIS, SURFACE EXPRESSION, AND SECRETION OF IMMUNOGLOBULIN BY PEYER'S PATCH CELLS IN THE MOUSE. *(E.)* Vitetta, E. S.; McWilliams, M.; Phillips-Quagliata, J. M.; Lamm, M. E.; Uhr, J. W. (Univ. Texas Southwestern Medical Sch., Dallas, Texas 75235). *J. Immunol.* 115(2):603-605, 1975.

Peyer's patch cells were studied to determine whether presence of a δ-chain accounted for heavy-chain deficits (surface and intracellular) observed by immunofluorescence. Peyer's patches from BALB/c mice were radioiodinated and cultured *in vitro* with ^{3}H-leucine. Cells and medium were separated by centrifugation. The cells were lysed and the lysates dialyzed. Both lysates and secretions were centrifuged and the supernatants treated with rabbit anti-μ, anti-α, and anti-γ, polyvalent anti-Ig (μ, γ, α, κ, λ) or rabbit antibacteriophage ϕ x 174 (anti-ϕx) (control) and goat anti-rabbit Ig. Precipitates were subjected to electrophoresis. Neither IgG nor IgA was detected on the cell surface. In five experiments IgM constituted 5-15% of the total surface Ig. The most prominent heavy chain, precipitated by polyvalent serum only, had an approximate molecular weight of 68,000. Like the human δ-chain it was prevalent on the cell surface but not in the serum, was susceptible to proteolysis, was about 15% carbohydrate, and did not react with μ, γ, or α. In addition, both the δ-chain and the prominant heavy chain had similar molecular weights of both the assembled molecules and the intact heavy-chain. IgD constituted 85-95% of the total labeled Ig on the cell surface. An additional peak of molecular weight 40-45,000 was precipitated by most antisera and the control. Electrophoresis of the cell secretions showed identical patterns to those of the cell lysates. The δ- and μ-chain peaks were sharp, but the α-chain was heterogeneous. Anti-Ig precipitated an additional heavy chain peak of about 48,000 m.w. Labeling failed to yield a heavy chain with a molecular weight corresponding to that of an intact δ-chain. It is concluded that the δ-chains probably account for the heavy chain deficit on Peyer's patch cells.

6600 CHOLINERGIC INNERVATION OF THE GASTRIC WALL OF THE CAT. *(E.)* Kyosola, K.; Veijola, L.; Rechardt, L. (Dept. Anatomy, Univ. Helsinki, Finland). *Histochemistry* 44(1):23-30, 1975.

Morphologic patterns in the intrinsic cholinergic innervation of the gastric wall of the cat were studied. Sections of gastric wall were excised from anesthetized cats. Tissue was subjected to immersion fixation, perfusion fixation, or perfusion and subsequent immersion. Cholinesterases were demonstrated by one of two thiocholine techniques: Gomori's modification of the Koelle-Friedenwald technique or the direct-coloring copper-ferrocyanide method. Acetylcholinesterase-positive nerve fibers or small fascicles were observed in the muscularis externa of the pyloric region, running parallel to the stomach wall. A wide-meshed acetylcholinesterase-positive nerve network with large submucosal ganglia was observed in the serosa and in the subserosa. The general pattern of organization of the intrinsic cholinergic nervous apparatus of the fundic region was similar to that observed for the pyloric region. Duodenal tissue samples (controls) had acetylcholinesterase activity mainly confined to nerves in all layers of the duodenal wall. All smooth muscle layers of the gastric wall showed some degree of activity of the nonspecific cholinesterases; activity was most intense in the muscularis mucosae, moderate in the longitudinal muscle layer, and relatively weak in the circular muscle layer. It is concluded that the distribution of cholinesterase activity found indicates that the intrinsic cholinergic neural control concerns both the motor and secretory functions of the gastric mucosa.

6601 VEGETATIVE INNERVATION OF THE ESOPHAGUS. III. INTRAEPITHELIAL ENDINGS. *(Eng.)* Rodrigo, J.; Hernández, C. J.; Vidal, M. A.; Pedrosa, J. A. (Instituto Cajal, CSIC, C/Velázquez 144, Madrid 6, Spain). *Acta Anat. (Basel)* 92(2):242-258, 1975.

The vegetative innervation of the esophagus was studied in ten cats and three rhesus monkeys, with particular attention to the existence and morphology of the intraepithelial nerve endings. The esophagi were impregnated using the osmium tetroxide-zinc iodide technique. The nerve fibers reaching the neighborhood of the epithelium were shown to come from the distal portion of the submucous plexus. In the area of the cells of Langerhans, the fibers are mainly nonmyelinic, grouped together in bundles of different sizes, and surrounded by a common Schwann protoplasm. Towards the distal end, the nerve fibers begin to group together into thin nerve strings until they reach the basal layer, where they initially consist of two or three nerve fibers and later of completely isolated fibers, thus forming a subepithelial plexus in which all the fibers are nonmyelinic and completely varicose, some of them being associated with the blood capillaries in this area. The upper portion of the esophagus (next to the pharynx) and the lower portion (next to the cardia) show the densest penetration by nerve fibers, while the middle portion is penetrated only sporadically by an occasional fiber. In the upper portion, the bottoms of the grooves formed by the longitudinal folds show the greatest penetration of the basal surface by nerve fibers. In the middle portion, the fibers may penetrate at any point in the basal surface; in the lower portion, penetration is generally through the papillae formed by the epithelial covering in this area. The fibers are thin and delicate through their epithelial course and are probably directly attached to the epithelial cell bodies. The nerve fibers within the epithelium end freely in the spaces between the epithelial cells not far from the basal layer or, more frequently, near the lumen of the viscera. The morphology of the terminal ends varied considerably and was not associated with their position within the epithelium. The terminal portions of some of the fibers in the subepithelial plexus in the lower part of the esophagus form delicate laminar expansions which terminate the fiber or are inserted into the preterminal portion. These formations connect only with the cells forming the basal membrane of the epithelium and their endings generally assume a glomerular aspect. No neuroepithelial cells were observed in conjunction with the terminal apparatus. The data suggest that the nerve fibers within the mucous epithelium of the esophagus are solely of a sensory character.

6602 ELECTRONMICROSCOPIC OBSERVATIONS ON THE EFFECTS OF ORALLY ADMINISTERED ASPIRIN AND ASPIRIN-BICARBONATE MIXTURES ON THE DEVELOPMENT OF GASTRIC MUCOSAL DAMAGE IN THE RAT. *(E.)* Rainsford, K. D. (Univ. Tasmania, Medical Sch., GPO Box 252C, Hobart, Australia 7001). *Gut* 16(7):514-527, 1975.

The effects of aspirin (50-200 mg/kg p.o.) and an equimolar mixture of aspirin (200 mg/kg p.o.) with sodium bicarbonate on the fine structure of the gastric mucosa were studied in starved and nonstarved male hooded Wistar rats. The animals were killed 10 min to 5 hr after drug administration. The glandular mucosa was treated with formaldehyde and/or glutaraldehyde fixatives and examined by electron microscopy. In some experiments, the stomachs of rats anesthetized with pentobarbital sodium were perfused with fixative *in situ* prior to sectioning. Aspirin alone produced focal erosions in the corpus and body of the stomach of the fasted animals with evidence of bleeding in and around the eroded areas; the erosions were first evident 1 hr after treatment. Most of the damage occurred in the middle of the greater curvature of the corpus, and the damage was reduced in animals given lower doses of aspirin. Very little if any damage was produced by aspirin alone in the nonfasted animals or by aspirin plus bicarbonate in the fasted animals. Within 10 min after aspirin administration in the fasted rats, the surface mucosal layer assumed a whitish appearance and showed extensive sloughing. Extensive mucosal edema was observed in the starved animals given 150 or 200 mg/kg of aspirin alone, the degree of edema being reduced after 50 mg/kg of aspirin alone, aspirin plus bicarbonate, or 200 mg/kg aspirin in the nonfasted rats. The blood vessels in the stomach were extensively swollen in all rats given aspirin. On a fine structural level, a temporal sequence of events involving direct physical exfoliation of mucosal cells and selective structural damage to the parietal cells followed by structural damage indicative of a disturbance in oxidative and biosynthetic functions in the cells near the developing erosions was observed after 200 mg/kg aspirin in the fasted rats. The data indicate that the presence of aspirin particles in intimate contact with the mucosa is important in the development of gastric damage.

6603 EFFECT OF pH ON BILE SALT INJURY TO MOUSE GASTRIC MUCOSA. A LIGHT- AND ELECTRON-MICROSCOPIC STUDY. *(E.)* Eastwood, G. L. (United States Naval Hosp., Philadelphia, Pa.). *Gastroenterology* 68(6):1456-1465, 1975.

The influence of pH on bile salt-induced gastric injury and the morphological mode of injury were studied. Taurocholate and glycochenodeoxycholate were used. Adult male Swiss mice received solutions by esophageal intubation. Mucosal injury was graded as normal (0), mild injury (1), moderate injury (2), and severe injury (3). Taurocholate at pH 1 caused mucosal injury even at concentrations of only 0.1 mM and at 2 min of exposure (mean grade of severity, 1.9). A light micrograph of this injury showed that almost all surface mucous cells were damaged. There was also a decrease in staining intensity, mottling of the nucleus, and, in some instances, there was cell disruption. The severity of injury was greater with increasing concentration or duration of exposure. Taurocholate had no injurious effect at pH 3, 5 or 7. At pH 1, the mucosal injury caused by glycochenodeoxycholate was less than that caused by taurocholate (2 mM bile salt for 15 min gave a mean grade of severity of 1.1). At pH 3, however, glycochenodeoxycholate produced mucosal injury of grade 1.3; no injury was produced at pH 5 or 7. Electron microscope studies of injuries showed clumping of the nuclear chromatin as being indicative of mild cell injury. Most severely injured cells were often disrupted and sometimes fragmented. It is concluded that the morphological effects of bile salts are not specific and may relate to the ability of the agent, whether it is a primary irritant or a hydrogen ion, to gain entry to the cell interior.

6604 THE EFFECT OF BILE AND OF SODIUM TAUROCHOLATE ON THE EPITHELIAL CELL DYNAMICS OF THE RAT SMALL INTESTINE.

(Eng.) Roy, C. C.; Laurendeau, G.; Doyon, G.; Chartrand, L.; Rivest, M. R. (Hôpital Sainte-Justine, Montreal, Canada). *Proc. Soc. Exp. Biol. Med.* 149(4):1000-1004, 1975.

The regulatory role of bile and bile acids on epithelial cell dynamics in bile fistula rats after biliary diversion and under a constant duodenal Na taurocholate perfusion was studied. Bile fistula was established by insertion of a cannula in the common duct, 5 mm distal to hepatic duct bifurcation in ten male Sprague-Dawley rats. The control group consisted of ten sham-operated rats. After 48 hr, the absence of bile from the intestinal lumen led to: a decreased proliferative cell pool (based on a decrease of the mucosal scraping DNA specific activity), reduced cell shedding and a 50% decrease of the labeling index in the ileum. Constant duodenal perfusion of Na taurocholate for 48, 60, 72 and 96 hr in animals with biliary diversion was associated with: deepening of crypts, decreased crypt to villus ratios and acceleration of epithelial cell migration rate on the crypt-villus units. The data suggest that bile and, in particular, bile acids constitute important regulatory factors influencing enterocyte proliferation, migration and loss.

6605 EFFECTS OF p-CHLOROMERCURIBENZENE SULFONATE UPON ULTRASTRUCTURE OF CANINE GASTRIC SURFACE CELLS.

(E.) Zalewsky, C. A.; Moody, F. G.; Simons, M. A. (Univ. Utah Medical Center, 50 North Medical Drive, Salt Lake City, Utah 84132). *Gastroenterology* 69(2):427-438, 1975.

The morphological events involved in acute gastric erosion formation were studied systematically in mongrel dogs of both sexes. Segments of the greater curvature of the stomach were removed from the fasted animals and placed in double lumen lucite chambers. The experimental side of the mucosa was bathed with 10 mM *p*-chloromercuribenzene sulfonate (PCMBS) in 0.14 M HCl or 10 mM PCMBS in 0.1 M Tris buffer adjusted to pH 7.8-7.9 with HCl and made isosmotic with mannitol. The control sides of the mucosa were bathed with 0.15 M HCl, 0.1 M Tris buffer-mannitol without PCMBS. The gastric mucosa was observed visually and the arterial blood pressure was monitored throughout the experiment. The exteriorized segments of stomach were removed at various intervals and examined autoradiographically and by electron microscopy. Exposure of the mucosal surface of the exteriorized fundic segments to PCMBS resulted in gross and microscopic structural changes. The first visible response after PCMBS in isosmotic HCl was an intense release of periodic acid-Schiff-stainable mucous. Within 2 min, radioactive PCMBS was found within cells along the entire depth of the gastric glands. At 15 min, the surface cells showed vacuolization of the cellular cytoplasm, dilation of the perinuclear and intercellular spaces, mitochondrial swelling, loss of microvilli, and plasmalemma irregularities. The tight junctions, Golgi apparatus, and mucous granules appeared unaltered. However, in advanced injury (30 min), the mucous granules became less dense and their membranes, which were normally smooth, became fragmented and convoluted. Necrotic parietal cells were extruded into the lumen. Damage only rarely extended into the deeper glandular and connective tissue areas. Although the changes were of the same morphological type whether the PCMBS was in acid or buffer solution, the changes induced by acidified PCMBS occurred more rapidly and involved a greater number of cells. It is likely that PCMBS alters the permeability characteristics of the plasma membrane facing the lumen and of that part of the membrane forming the lateral sides of the cells.

6606 EFFECT OF DIOCTYL SODIUM SULFOSUCCINATE ON STRUCTURE AND FUNCTION OF RODENT AND HUMAN INTESTINE.

(E.) Saunders, D. R.; Sillery, J.; Rachmilewitz, D. (Dep. Med. RG-20, Univ. Washington, Seattle, Wash. 98195). *Gastroenterology* 69(2):380-386, 1975.

The hypothesis that dioctyl sodium sulfosuccinate (DSS), an anionic detergent often described as a stool softener, blocks water absorption in the small and large intestines was studied in fasted, anesthetized male Sprague-Dawley rats. Jejunal, ileal, and colonic segments were created and infused with buffer (9.5 ml/min in the small intestinal segments and 0.75 ml/min in the colonic segments) and then with buffer containing DSS (0.1-2.0 mM). Net water transport was measured under steady-state conditions. To test whether the observations in rats were relevant to the human jejunum, segments of jejunum in three healthy men and one healthy woman were studied by the triple lumen tube technique; buffer or buffer containing DSS (0.5-1.0 mM) were infused into the fasted subjects and the jejunal contents were aspirated at various intervals. In the rats, DSS inhibited water absorption in all three segments of intestine, the degree of inhibition being linearly related to the $\log_{10}$ of the DSS concentration. Histologically, the jejunal segments appeared unchanged by DSS infusion, but the detergent (0.5-2.0 mM) did alter the histologic appearance of the surface absorptive cells of the colon. In the latter case, the cells were flattened and their brush borders were no longer readily seen; the number of cells involved increased with increasing DSS concentration. DSS (0.5 mM) also significantly depressed water absorption (by 80%) in the human subjects. The effect was reversible and sodium, potassium, and chloride moved in parallel with the net water transport. The data indicate that DSS could be regarded as a stimulant laxative.

6607 MAST CELL INCREASE IN THE DUODENUM AND KIDNEY OF MAGNESIUM-DEFICIENT RATS. *(E.)*

Veilleux, R. (Dept. Anatomy, Univ. Montreal, Quebec, Canada). *Lab. Invest.* 33(1):80-87, 1975.

The possible influence of magnesium deficiency on increasing the population of subepithelial intestinal and kidney mast cells was studied. Of 52 Sprague-Dawley rats, 30 were fed a magnesium-deficient diet, while 10 controls were fed normally. Two controls and six deficient rats were killed after one to five weeks, and pieces of duodenum and kidney were either fixed and stained with Alcian Blue-safranin or quenched in liquid nitrogen cooled monochlorodifluoromethane, freeze-dried, exposed to formalin vapor, and subjected to fluorescence microscopy. Six of the remaining rats were kept on the deficient diet for four weeks, given 100 mg/kg L-dopa i.p. and killed after 2 hr. The last six were normal diet rats given L-dopa. The deficient rats showed a marked increase in duodenal subepithelial mast cells beginning at two weeks. Their mast cells had a more intense yellowish fluorescence than control mast cells. Administration of L-dopa after the fourth week enhanced the fluorescence in both deficient and control rats. After two to three weeks of deficiency, at least a twofold increase of Alcian Blue-positive fluorescent cells could be seen in the lamina propria, which sometimes lined up at the base of the epithelium. In all cases the epithelium itself was devoid of these cells. In the kidney, mast cells were extremely rare or absent in the controls by both Alcian Blue and formalin-induced fluorescence. L-dopa did not disclose any mast cells. In the deficient rats, both staining techniques showed numerous mast cells restricted to the cortex. These were apparent after the second week, mostly in the intertubular spaces. Alcian Blue fluorescent mast cells were also seen in the glomeruli. The intertubular mast cells were sometimes associated with local fibrous proliferative activity, or squeezed into the thin connective tissue sheath surrounding each tubule. The fluorescence ranged from yellow to green, usually contrasting with the intense yellow of the normal mast cells of the hilum and capsule. L-dopa markedly increased the intensity of fluorescence of all mast cells. It is concluded that magnesium deficiency in the rat increases the intestinal subepithelial mast cell population and the kidney cortical tubular and glomerular mast cell population.

6608 MORPHOLOGICAL STUDIES OF THE RAT SMALL INTESTINE AFTER JEJUNO-ILEAL TRANSPOSITION.

(E.) Gronqvist, B.; Engstrom, B.; Grimelius, L. (Univ. Hosp., Uppsala, Sweden). *Acta Chir. Scand.* 141(3):208-217, 1975.

Changes in small bowel mucosa after jejuno-ileal transposition were studied by light and electron microscopy. Male Sprague-Dawley rats were divided into three groups of nine animals: 1) controls; 2) sham-operated; and 3) jejuno-ileal transposed rats. Specimens of small intestine were taken at 2, 6 and 12 weeks postoperatively, from three rats in each group. Light, fluorescence, scanning electron and electron microscope examinations were made of four biopsy sites: distal to the proximal anastomosis, proximal and distal to the middle anastomosis, and proximal to the distal anastomosis. Weight increase in the third group 2 weeks postoperatively was lower than that of controls (33.4, 20.0 and 0.7% for groups 1, 2 and 3, resp.). At 6 and 12 weeks there was no significant difference between the groups (98.7, 96.0 and 87.5%, resp., at 12 weeks). No cell damage was seen in any group. Fluorescent microscopy showed the same number of cells and the same intensity of staining in all groups. There were no significant differences seen in the lengths and breadths of the villi, nor were changes seen in cytoplasmic organelles or microvilli. Quantitative studies showed that, at 2 and 12 weeks postoperatively, the villi of the ileum in the third group were significantly higher than those of the other two groups (19.7 and 58.4%, resp., at 2 and 12 weeks). The transposed jejunum also showed higher villi at 2 weeks (6.4%), but at 12 weeks the difference had decreased (0.1%). At 2 weeks the cell density in the transposed ileal segments in group 3 animals (229 cells/mm of basement membrane) was significantly higher than in the other two groups (209 and 199 cells/mm, resp., for control and sham-operated animals). At 12 weeks, the values for group 3 animals were significantly lower. From these data the mechanisms governing the development of hypertrophy in the transposed intestine are not clear. It is suggested that alterations in the intraluminal conditions, such as pH, pressure and possibly bacterial flora, may play a role.

6609 MORPHOLOGY IN THE CAT ILEAL MUCOSA FOLLOWING CONSTRUCTION OF AN ILEAL RESERVOIR OR TRANSPOSITION OF PATCHES TO DIFFERENT LOCATIONS.

(E.) Philipson, B. (Dept. Surgery, Sahlgrenska Inst., S-413 45 Goteborg, Sweden). *Scand. J. Gastroenterol.* 10(4):369-377, 1975.

Whether the structural changes recorded in human ileal reservoirs could be reproduced under similar conditions in cats, and the possibility of reversal of these morphological changes, was studied. Fasted and anesthetized domestic cats were given ileal reservoirs. The cats were also subjected to a variety of transpositions: an ileal patch to the cecum and later to the jejunum; an ileal patch to the urinary bladder; and an ileal segment to the sigmoid colon. At 1 to 3 months after surgery, the animals were sacrificed, and samples were taken from the reservoir, and from the ileum 5 cm proximal and 3 cm distal to the reservoir. The villi appeared to be shorter than in the normal ileum, and in most instances had leaf- and club-like shapes. Proximal and distal to the reservoir the villi were finger-like. This shape was restored when the patches were removed from the cecum to the jejunum. An inflammatory reaction was noted, which was especially pronounced in patches transposed to the urinary bladder. There was a significant decrease in villous height in the reservoir (353 μ) and distal to it (498 μ) compared to controls (760 μ); in the ileal patches transposed to the cecum (355 μ; control, 760 μ) and jejunum (546 μ; control, 750 μ). The villus height reduction was especially pronounced after transposition to the urinary bladder (266 μ; control, 760 μ). Increases in villus height were accompanied by an increased mitotic index. It is concluded that the structural changes seen in the human reservoir can be reproduced in animal models. These data suggest that the most important factor in the development of mucosal alterations is the irritating nature of the luminal contents.

6610 ELECTRON MICROSCOPIC STUDY OF CHRONIC PANCREATITIS INDUCED BY ADJUVANT INJECTION IN THE DOGS. *(E.)* Tsunoda, T.; Nakayama, I.; Taura, S.; Yoshino, R.; Ito, T.; Tsuchiya, R. (Nagasaki Univ. Sch. Med., Japan). *Nihon Rynsho Denshi Kenoikyo Gakkai-Shi* 7(3/4):345-346, 1974.

The histogenesis of chronic pancreatitis (induced in dogs) was studied by electron microscopy. Mongrel dogs (10-15 kg) received 1 ml of Freund's complete adjuvant by injection into the pancreatic parenchyma. The animals were sacrificed at 6, 9 and 24 hr, and 2, 4, 6, 8, 10, 20 and 30 days after injection. An increased number of lymphatic vessels with marked dilatation and intensive interstitial edema were noted at 6-24 hr, accompanied by the eduction of fibrin. Granulomatous lesions of various sizes formed in the interstitial tissue at 2-10 days. Each had an evident lumen without necrotic change in the central part, where fat and PAS stains were negative. At 6 days, the endothelial cells disappeared. The lymphatic wall was occupied by various inflammatory cells with granuloma formation. In the last stage of the experiment (20-30 days), some old granulomas still remained in part, but the interstitial tissue was mostly replaced by dense collagen fibers. This last stage closely resembled the histological picture found in human chronic pancreatitis.

6611 EFFECT OF SUBTOTAL RESECTION OF THE SMALL INTESTINE ON PANCREATIC STRUCTURE AS A FUNCTION OF THE TYPE OF INTESTINAL ANASTOMOSIS. *(Rus.)* Zhuchenko, S. P. (Vinnitsa Medical Inst., USSR). *Klin. Khir.* (5):73-75, 1975.

6612 NERVE NETWORK AND NERVE CELLS OF THE LARGE INTESTINAL WALL. *(Ger.)* Stach, W. (Div. Medicine, Univ. Rostock, Rostock, Germany). *Zentralbl. Chir.* 100(2):75-85, 1975.

6613 STRUCTURAL FEATURES OF THE MUCOSA OF HUMAN FETAL SMALL INTESTINE. *(E.)* Moxey, P. C.; Trier, J. S. (Peter Bent Brigham Hosp., Boston, Mass.). *Gastroenterology* 68(4):1002, 1975.

6614 EFFECTS OF STEROIDS ON MATURATION AND DIFFERENTIATION OF CULTURED FETAL STOMACH. *(E.)* Yeomans, N. D.; Trier, J. S.; Markezin, E. T.; Moxey, P. C. (Peter Bent Brigham Hosp., Boston, Mass.). *Gastroenterology* 68(4):1001, 1975.

6615 HISTOLOGICAL AND HISTOCHEMICAL STUDIES ON ANIMALS ON THE EFFECT OF STIMULUS SUMMATION ON THE GASTRIC MUCOSAL BARRIER. *(Ger.)* Bergmann, M.; Goischke, H. K.; Goischke, E. M. (Medizinische Universitatspoliklinik, DDR-69 Jena, Bachstrasse 18, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(5/6):279-286, 1974.

6616 THE LYMPHATIC BED OF THE MUSCLE LAYER OF THE SMALL INTESTINE OF MAN AND ANIMALS IN ONTOGENESIS. *(Rus.)* Gusejnov, T. S. (Dept. Normal Anatomy, Dagestan Medical Inst., Makhach-Kala, USSR). *Arkhiv. Anat. Gistol. Embriol.* 68(5):66-70, 1975.

6617 A CONTRIBUTION TO THE HISTOGENESIS OF THE OESOPHAGEAL EPITHELIUM IN MAN. *(E.)* Sevcenko, G.; Vacek, Z. (Inst. Embryology, Charles Univ., Prague, Czechoslovakia). *Folia Morphol. (Warszawa)* 22(3):217-218, 1975.

6618 A PARAGANGLION CELL IN THE LAMINA PROPRIA OF THE GASTRIC MUCOSA. *(E.)* Fukuda, S.; Seki, A.; Matsuo, Y. (Faculty of Medicine, Univ. Tokyo, Japan). *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3-4):335-336, 1975.

6619 CYTOPLAMIC [SIC] CRYSTALLINE STRUCTURE IN HUMAN LIVER CELLS. *(E.)* Takasan, H.; Yamada, T.; Ozawa, K.; Honjo, I. (Kyoto Univ. Sch. Med., Kyoto, Japan). *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3-4):251, 1974.

6620 FINE STRUCTURE OF HEPATIC FIBROSIS. *(E.)* Tanikawa, K.; Abe, N.; Miyakoda, U.; Ikejiri, M.; Kawaguchi, M. (Kurume Univ. Sch. Medicine, Japan). *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3-4):367, 1975.

See also, 6680, 6730, 6744, 6821, 6822, 6825, 6853, 6907, 6938, 7350, 7397, 7497, 7822.

6621 A MODIFIED FECAL EXCRETION TEST FOR ASSAYING INTESTINAL ABSORPTION OF ^{3}H-FOLIC ACID.

(E.) Elsborg, L. (Univ. Dept. Medicine, Aarhus Amtssygehus, DK-8000 Arhus C, Denmark). *Scand. J. Gastroenterol.* 10(2):207-208, 1975.

A folic acid absorption test is described, based on direct estimation of the nonabsorbed fecal fraction of an ingested dose of ^{3}H-folic acid. Fasting normal subjects (20) were fed 2 μCi (200 μg) of ^{3}H-folic acid and 0.4 μCi of $^{60}Co_2O_3$. Each of three 24-hr stool collections was placed on a sodium iodide crystal and only the fecal specimen containing the greatest amount of radioactivity was analyzed. Gas proportional counting was used to estimate ^{3}H activity after homogenization of the sample. The absorption of folic acid was calculated in percent of the amount ingested, given (1.00 - f) x 100%, where f is the unabsorbed fraction of folic acid. The counting efficiency for ^{3}H was found to be approximately 40%. In the subjects tested, fecal excretion of folic acid fitted well with a logarithmic normal distribution. The 0.95 range for f was 0.05 to 0.25. Accordingly, folic acid absorption ranges from 75% to 95% in normal subjects. It is suggested that this method may be useful for laboratories with less advanced equipment for radiochemical assay.

6622 PERMANENT BILE DUCT CANNULATION IN THE MONKEY. A MODEL FOR STUDYING INTESTINAL ABSORPTION.

(E.) Meszaros, J.; Nimmerfall, F.; Rosenthaler, J.; Weber, H. (Pharmaceutical Dept., Sandoz Ltd., 4002 Basel, Switzerland). *Eur. J. Pharmacol.* 32:233-242, 1975.

An experimental model for studying the intestinal absorption and biliary excretion of drugs and their metabolites is described. Cannulas of silicon rubber were inserted into the common bile duct up to the entrance of the cystic duct and through the stomach wall and the pylorus into the duodenum (to the entrance of the common bile duct) in 50 male rhesus monkeys. The cannulas were fixed at the point of insertion and the protruding portions were cut and joined to a plexiglass U-tube end-piece; when the animals were not being tested, the two tubes of the end-piece were joined by the U-tube, thereby giving the animals complete freedom. Postoperatively, the animals showed uneventful recovery and remained in normal condition. However, in over 90% of the animals, the catheter system was rejected after 8 or more wk of implantation and shunts were formed for the passage of bile around the point of insertion; this had no apparent detrimental effect on the animals. The specific gravity of the liver bile remained normal postoperatively and BSP tests for liver excretory function yielded values similar to those found in intact monkeys. Among the bile fistula animals, those with low k^{1}-values for BSP elimination showed the highest specific activity levels for alkaline phosphatase, SGOT, SGPT, and glutamate dehydrogenase; the specific activities of these enzymes were similar to those in 23 intact monkeys. Absorption tests carried out in nine bile fistula animals after intraduodenal ergotamine tartrate infusion showed a 96% average recovery of the applied dose and a mean intestinal absorption of 45% of the administered dose; the tests showed satisfactory reproducibility in the same animals over periods of 2 to 36 wk. This model appears to be well suited to studying the intestinal absorption of drugs which are excreted primarily in the bile. By sparing the animals the stress and discomfort of continuous chair sitting during repeated experimentation, it was possible to maintain them in a fit and near-normal condition throughout the study.

6623 PROPERTIES OF GLYCEROL-^{75}SE-TRIETHER: A LIPID-SOLUBLE MARKER FOR THE ESTIMATION OF INTESTINAL FAT ABSORPTION.

(E.) Hoving, J.; Valkema, A. J.; Wilson, J. H. P.; Woldring, M. G. (Univ. Hosp., Groningen, Netherlands). *J. Lab. Clin. Med.* 86(2):286-294, 1975.

The properties of a ^{75}Se-labeled glycerol triether were investigated in rat (Wistar stain, 180-200 g) experiments designed to test this substance as a nonabsorbable marker for measuring intestinal fat absorption. ^{131}I-triolein was used as tracer fat, and absorption was calculated using the isotope balance and isotope ratio methods. A mean of 99.4% of the 10 mg ^{75}Se-triether dose was recovered in the feces during the seven-day collection period. The separation of the lipid extract of the stools on TLC (thin-layer chromatography) revealed several ^{75}Se-containing compounds, of which one had the same mobility pattern as ^{75}Se-triether. Nonabsorbability of this compound was almost complete with a 98.2% recovery. All rats survived the experimental period with no significant weight gain, hematological, blood chemistry, or histological changes. No significant difference was noted when the amount of marker was increased. Comparison of methods gave correlation coefficients of 0.99 and 0.89 and regression coefficients of 1.02 and 0.99 depending on the time elapsed from time of administration (0-12 hr and 12-24 hr, resp.), showing that the marker moves through the gastrointestinal tract at the same rate as fat. If marker and test fat are given in a single dose, the estimation of fat absorption from the random stool sample is valid only if the marker/test fat ratio in feces is influenced exclusively by absorption of fat. The simplicity of the ^{75}Se-triether estimation in feces is a major advantage over other lipid-soluble markers and may provide a reliable and rapid test for estimation of intestinal fat absorption in man.

6624 SODIUM CHLORIDE REFLECTION COEFFICIENT IN RABBIT GALL BLADDER.

(E.) Monticelli, G.; Celentano, F.; Torelli, G. (Inst. General Physiology Physics, Univ. Milan, via Mangiagalli 32, 20133 Milano, Italy). *Biochim. Biophys. Acta* 401(1): 41-50, 1975.

The relation between volumetric flow and its driving forces, containing the Staverman reflection coefficient, was tested for sodium chloride in rabbit gallbladder and the reflection coefficient was evaluated. Everted gallbladders were perfused; the volumetric flow was measured gravimetrically. Experiments were performed with 15 gallbladders, varying sucrose concentration in a mucosal bathing solution between 0 and 200 mM, while the serosal solution (118.4 mM of NaCl, 25 mM of $NaHCO_3$, 4.7 mM of KCl, 2.5 mM of $CaCl_2$, 1.2 mM of KH_2PO_4 and 1.2 mM of $MgSO_4$, type A) remained unchanged. There was a linear dependence of the volumetric flow (J_v) on sucrose osmotic pressure difference in the concentration range of 0 to 80 mM. The permeability coefficient (L_p) in this range was 0.507×10^{-11} $cm^3 \times dine^{-1} \times s^{-1}$. Gallbladder permeability at higher sucrose concentrations decreased to reach a steady value at 0.124×10^{-11} $cm^3 \times dine^{-1} \times s^{-1}$ above 100 mM of sucrose. Negative $\Delta\pi_s$ (the partial osmotic pressure difference of solute S in the two compartments) values were obtained by lowering NaCl concentration in the outside solution, while these values were positive when the salt concentration was increased in the same solution. Volumetric flow was linearly related to $\Delta\pi_s$ and $\Delta\pi_i$. The mean reflection coefficient was 0.60, and the apparent reflection coefficient was found to depend on experimental conditions. It is concluded that a measure of membrane specificity for a species which is both actively and passively transported can be obtained only by accounting explicitly for the active transport contribution to volumetric flow.

6625 STUDIES OF GASTROINTESTINAL INTERACTIONS. VII. CHARACTERISTICS OF THE ABSORPTION PATTERN OF SUGAR, FAT AND PROTEIN FROM COMPOSITE MEALS IN MAN. A QUANTITATIVE STUDY.

(E.) Johansson, C. (Dept. Medicine and Gastroenterology, Karolinska Inst., Stockholm, Sweden). *Scand. J. Gastroenterol.* 10(1): 33-42, 1975.

The characteristics of carbohydrate, fat and protein absorption from composite meals during transit through the upper intestine were studied. Intubated healthy volunteers received 300 ml of two liquid test meals on different occasions. The first meal contained 3.6 g of protein/100 ml, 5.9 g of corn oil/100 ml, 5.1 g of lactose/100 ml and 10 g of glucose/100 ml. The standard test meal was the same, excluding the glucose. Polyethylene glycol (3 g/100 ml) was used as a marker. An average of 75% of the emptied amounts of sugar and 80% of the emptied fat and protein was absorbed during transit through the proximal 70 cm of the intestine. Differences in the absorption patterns between the two meals were recorded, resulting from their different intragastric behavior and gastric emptying patterns. Within the first hr significantly higher amounts of fat and protein were absorbed after the glucose-free than after the glucose-containing meal, whereas from the latter most of the glucose was absorbed early after ingestion. The absorptive capacity of the investigated segment was not exceeded for any component of the meals, owing to compensatory mechanisms by which the gastric emptying rate was inhibited and the transit time through the segment prolonged. The efficiency of sugar absorption was related to the transit time through the segment, in that a constant fraction was eliminated from the intestinal lumen/min increase of the mean transit time. The net endogenous contribution of protein and fat at the exit of the segment amounted to an average of 3.0 g protein and 1.2 g fat during 3 hr. These data suggest that the absorption rate is determined by the gastric emptying rate, which is in turn regulated by limiting factors released after absorption of the nutrient into the mucosal cell.

6626 INTERACTION OF AMINO ACIDS, PEPTIDES AND PEPTIDASES IN THE SMALL INTESTINE.

(E.) Cheeseman, C. I.; Smyth, D. H. (Dep. Physiol., Univ. Sheffield, England). *Proc. R. Soc. Lond. (Biol.)* 190(1099):149-163, 1975.

The effects of various amino acids, peptides and peptidases on intestinal absorption were studied in Sheffield rats. Everted sacs prepared from the combined jejunum and ileum were shaken for 30 min in bicarbonate saline solution containing β-alanine, L-alanine, L-proline, L-methionine, D-methionine, L-leucine, L-histidine, glycyl-L-leucine, L-leucylglycine, glycylglycine, D-leucyl-glycine, L-leucyl-L-alanine, and/or cobalt chloride; in some experiments, part of the Na in the bicarbonate saline was replaced by choline chloride. In another set of experiments, the combined jejunal-ileal segments were homogenized and the resulting suspension was shaken with bicarbonate solution containing the above-mentioned substances. The hydrolysis of glycylglycine by the intestinal homogenates was significantly inhibited by all amino acids tested except L-proline and L-alanine, L-histidine being by far the most effective inhibitor. Glycyl-L-leucine hydrolysis was also significantly inhibited by L-leucine, L-methionine, and L-histidine, while all amino acids tested except L-histidine significantly stimulated L-leucylglycine hydrolysis; in the latter case, L-histidine was a strong inhibitor. Similar results were obtained with the everted sacs. There was no evidence of competition between amino acids and dipeptides for an entry mechanism, but there was evidence for competition between different dipeptides. Cobalt caused stimulation of the dipeptidases in the homogenates but not in the everted sacs, which suggested that the dipeptidase was not accessible to cobalt in the intestinal lumen. The entry process of D-leucyl-glycine into the intestine showed evidence of saturation kinetics and was inhibited by reduction of the Na concentration in the bicarbonate solution. The results indicate that the terminal stage of digestion involves intracellular hydrolysis rather than contact hydrolysis, and point to a specific mechanism for peptide entry into the enterocyte from the lumen of the intestine.

6627 UPTAKE OF TAUROCHOLIC ACID INTO ISOLATED RAT-LIVER CELLS.

(E.) Schwarz, L. R.; Burr, R.; Schwenk, M.; Pfaff, E.; Greim, H. (Institut fur Toxikologie der Eberhard-Karls-Universitat Tubingen, D-7400 Tubingen, Wilhelmstrasse 56, Federal Republic of Germany). *Eur. J. Biochem.* 55(3):617-623, 1975.

The uptake of taurocholic acid into isolated rat liver cells was studied to further characterize the processes involved. Liver cells isolated from male Sprague-Dawley rats were incubated in a suspension containing 60 nCi of [^{14}C]taurocholate/ml of incubation medium and various concentrations of unlabeled taurocholate. Adsorption of taurocholate to the cell surface was terminated in less than 15 sec. A saturation constant of 0.55 mM and a total binding capacity of 3.8 nM/mg of cell protein were determined. The rate of uptake of taurocholate followed Michaelis-Menten kinetics, with the K_m equal to 19 μM and V equal to 1.7 nM/mg of protein/min. There was a broad pH optimum observed for uptake between pH 6.5 and 8.0. The activation energy amounted to 29 kcal/M. At high taurocholate concentrations (10 and 50 μM), an unusual upward bend was observed in the Arrhenius plot at lower temperatures. Taurocholate uptake was completely inhibited by taurochenodeoxycholate (K_i = 9 μM) and was noncompetitively inhibited by BSP (K_i = 3 μM). At physiological taurocholate concentrations, a 200-fold intracellular accumulation of taurocholate was observed. Uptake was inhibited by about 75% by either antimycin A, carbonylcyanide *m*-chlorophenylhydrazone or ouabain. Replacement of extracellular Na^+ by either K^+ or sucrose resulted in a 75% decrease of uptake. It is concluded that taurocholate uptake is a carrier-mediated process. It is further suggested that the energy for intracellular accumulation is made available by cotransport of Na^+.

6628 EFFECT OF DIET AND MICROBIAL FLORA ON INTESTINAL ABSORPTION OF SODIUM TAUROCHOLATE IN GERM-FREE RATS. *(E.)* Riottot, M.; Sacquet, E.; Mejean, C.; Leprince, C. (Laboratoire des Animaux sans Germes, C.N.R.Z., Jouy-en-Josas 78350, France). *Nutr. Rep. Int.* 12(1):1-7, 1975.

The effects of diet and microbial flora on the rate of intestinal absorption of sodium taurocholate were studied in germfree (axenic) and conventional (holoxenic) rats. The rats were maintained on a semi-synthetic diet containing no cholesterol or on a commercial diet containing 90 mg of cholesterol/100g of food. Segments of the small intestine were perfused with solutions of sodium taurocholate $(2,4\text{-}^3H)$ or $(4\text{-}^{14}C)$ and absorption was determined using liquid scintillation spectrometry. The perfusion method of Kimura was used to study absorption across the jejunum and ileum, while the perfusion method of Schiff was used to study absorption across the ileum only. The rate of absorption across the jejunum increased with increases in the amount of taurocholate in the perfusate; the augmentation was proportional to the taurocholate concentration in the rats given the commercial diet, but tended to be greater at the highest concentration (25 mM) in the rats given the semi-synthetic diet. Using Kimura's technique, the absorption rate was found to be higher in the ileum, where it increased considerably with increasing sodium taurocholate concentration. The absorption rate was not significantly affected by the presence or absence of intestinal microflora, but was much higher in the animals fed the commercial diet than in those fed the semi-synthetic diet. The results obtained using Schiff's technique were similar, but the absorption rates were lower and increased more slowly with increasing taurocholate concentration than was observed with Kimura's technique. The results suggest that the digestive tract microbial flora change the intestinal bile salt pool by mechanisms other than a variation in the bile salt absorption rate. It is also hypothesized that food cholesterol is responsible for the increase in the bile salt pool and absorption rate in the rats fed the commercial diet.

6629 EFFECT OF PARENTERAL ACETAZOLAMIDE ON INTESTINAL ABSORPTION OF SALT AND WATER IN MAN. *(E.)* Gerson, C. D.; Cohen, N.; Finkel, M.; Janowitz, H. D. (Mount Sinai Sch. Medicine, City Univ. New York, N.Y.). *Proc. Soc. Exp. Biol. Med.* 149(4):950-952, 1975.

The effect of i.v. acetazolamide administration on jejunal absorption was studied in man. After an overnight fast, six volunteers had a triple lumen tube inserted just beyond the ligament of Treitz. The proximal jejunum was infused with isotonic saline (154 mEq/ml at 9.5 ml/min). Polyethylene glycol (1.0%) was used as a dilution indicator. At the time infusion began, i.v. infusion was also started using 5% aqueous glucose. After 1 hr for equilibration and a second 1 hr period for a control study, acetazolamide was added to the i.v. perfusate (75 mg/kg) and infused for a 2-hr period. Measurements were taken during the second hr. During the two study periods, proximal and distal aspirates were collected at 1 ml/min. Proximal and distal collecting ports were separated by 30 cm. Aspirate determinations were made for water, sodium, chloride and bicarbonate flux. Each subject absorbed less water during the experimental than the control study period. The difference in mean values for the two periods (1.40 and 0.18 ml/cm/hr, resp.) was significant. Sodium absorption was reduced in five subjects, and chloride absorption dropped in all from means of 0.331 to 0.049 during perfusion of the drug. Mean bicarbonate concentration rose from 5.3 to 5.6 mEq/l, an insignificant change. It is concluded that i.v. acetazolamide has an inhibitory effect on jejunal absorption of sodium, chloride and water.

6630 PROPERTIES OF $(Na^+ + K^+)$-ACTIVATED ATPase IN RAT LIVER PLASMA MEMBRANES ENRICHED WITH BILE CANALICULI. *(E.)* Boyer, J. L.; Reno, D. (Dept. Medicine, Univ. Chicago, 950 E. 59th St., Chicago, Ill. 60637). *Biochim. Biophys. Acta* 401(1):59-72, 1975.

The properties of ATPase were evaluated with reference to the possible role of $(Na^+ + K^+)$-activated ATPase as a determinant of bile salt-dependent canalicular secretion in the rat. Membranes enriched with bile canaliculi were isolated from the hepatocytes of male albino Sprague-Dawley rats and optimum conditions for assaying $(Na^+ + K^+)$-activated ATPase were established. Enzyme marker studies of plasma membrane fractions revealed minimal contamination with non-plasma membrane material. The protein yield averaged 0.32 mg of protein/g of liver. Membrane $(Na^+ + K^+)$-activated ATPase activity was reproducible, and remained stable at 5 C. There was a linear relation between protein concentration and enzyme product over a 50 to 200 g protein range. When the sodium and potassium ion concentrations were varied, activity increased with $\mathrm{Na^+}$ concentrations up to 150 mM, but diminished at 200 mM. Increases in $\mathrm{K^+}$ concentrations above 5 mM had no effect. Imidazole was found to be the preferable buffer for assay of $(\mathrm{Na^+} + \mathrm{K^+})$-activated ATPase activity and the optimum pH was 7.8, while $\mathrm{Mg^{2+}}$-activated ATPase activity was most active at pH 8.0. Optimal specific activities of $(\mathrm{Na^+} + \mathrm{K^+})$- and $\mathrm{Mg^{2+}}$-activated ATPase activity occurred with $\mathrm{Mg^{2+}}$ concentrations between 1.0 and 2.5 mM. Higher $\mathrm{Mg^{2+}}$ concentrations resulted in diminished enzyme activity. Both the $\mathrm{Na^+}$ + $\mathrm{K^+}$ and the $\mathrm{Mg^{2+}}$-activated enzyme activities were temperature-dependent. Increasing concentrations of ouabain or scillaren progressively inhibited $(\mathrm{Na^+} + \mathrm{K^+})$-activated ATPase activity, but neither had any effect on $\mathrm{Mg^{2+}}$-activated enzyme activity. These data suggest that the $(\mathrm{Na^+} + \mathrm{K^+})$-activated ATPase activity in this membrane preparation are localized to the bile canaliculi, and are important to the secretion of bile salt-independent flow. Further investigations are recommended.

6631 EFFECT OF ASPIRIN ON IONIC MOVEMENT AND ACID HYDROLASE ACTIVITY OF EXPLANTS OF CANINE ANTRAL AND DUIDENAL MUCOSAE. *(E.)*

Himal, H. S.; Greenberg, L.; Boutros, M. I. R.; Waldron-Edward, D. (Div. Surgical Res., McGill Univ., Montreal, Quebec, Canada). *Gastroenterology* 69(2):439-447, 1975.

The activities of six acid hydrolases in antral and duodenal mucosae were determined before and after treatment with aspirin, and activity changes were correlated with mucosal barrier breakdown and changes in ion flux. Mongrel dogs were fasted 24 hr. The stomach was transected between the oxyntic gland area and the pyloric canal, and the antrum with intact blood supply was placed in a Lucite chamber. In five more dogs, the common bile duct was ligated and divided, and the mid-duodenum was devascularized, preserving the pancreaticoduodenal vascular arcade. The duodenum was transected between the major pancreatic portal duct and the pyloric sphincter, and the proximal duodenum was mounted in a Lucite chamber. Basal secretion was collected for 30 min, and test solutions of aspirin, hydrochloric acid and sodium chloride were instilled for 30 min and then aspirated. $\mathrm{Na^+}$, $\mathrm{K^+}$, $\mathrm{H^+}$, and $\mathrm{Cl^-}$ concentrations were determined. Mucosae from inside and outside the chamber and mucosae from control dogs were washed, homogenized, and assayed for cathepsin D, acid phosphatase, α or β-galactosidase, β-*N*-acetyl-glucosaminidase, and aryl sulfatase. Protein and soluble RNA were also determined. The hydrochloric acid-salt solution caused a net loss of $\mathrm{H^+}$ and $\mathrm{Cl^-}$ and a net gain of $\mathrm{Na^+}$ and $\mathrm{K^+}$. Aspirin treatment caused a much greater $\mathrm{H^+}$ loss and $\mathrm{Na^+}$ gain. Treatment also caused a rise in fluid volume secreted (from 0.00 to 0.20 ml/30 min by 120 min). Duodenal secretion rose from a basal value of 0.55 ml/30 min to 2.0 ml/30 min after acid-saline treatment. Aspirin treatment caused this value to fall to 1.82 ml/30 min after 120 min. Acid-saline caused great loss of $\mathrm{H^+}$. Net $\mathrm{H^+}$ loss was 1.8 $\mu\mathrm{Eq/cm^2}$ in the duodenum, as compared to 16,8 $\mu\mathrm{Eq/cm^2}$ in the antrum. $\mathrm{Na^+}$ gain was 14 times and $\mathrm{K^+}$ gain four times greater in the duodenum than in the antrum. Nonsedimenting proteins per gram of dry tissue was nearly equal in the antrum, fundus and duodenum; the fundus contained the most RNA. Cathepsin D activity was consistently higher in the stomach than in the duodenum. Treatment with aspirin and subsequent acid-saline washings increased the activities of five of the six acid hydrolases. It is concluded that aspirin acutely increases the activity of the acid hydrolases of the antrum and decreases that of the duodenum.

6632 INTESTINAL ABSORPTION OF FREE AND PROTEIN-BOUND DIETARY METHIONINE IN THE RAT. *(E.)*

Canolty, N. L.; Nasset, E. S. (Dept. Nutritional Science, Univ. California, Berkeley, Calif.). *J. Nutr.* 105(7):867-877, 1975.

Studies were undertaken to determine whether the rate of absorption of free dietary methionine differs from that of methionine incorporation in dietary protein. Isotopically-labeled compounds of methionine, L-[^{35}S]-methionine (^{35}S-Met), L-[^{75}Se]methionine (^{75}Se-Met), and 1 mCi/mg of selenomethionine were used as tracers in the test meals. Liquid or cooked and dried egg white was used in meals fed to male Long-Evans rats. Plasma and gastrointestinal contents were collected from 15 min to 16 hr after feeding. Plasma amino acids were determined after *ad libitum* diets containing free methionine. Protein-bound methionine in fresh egg white and free methionine left the stomach at the same rate, but protein-bound methionine in dried egg white was emptied from the stomach significantly more slowly than free methionine. Free methionine was absorbed from the intestine more rapidly than the protein-bound form. Concentrations and molar ratios of various amino acids in plasma changed briefly in response to methionine-supplemented test meals (0.4 g). Long-term changes were observed when methionine-supplemented diets were fed *ad libitum*. It is suggested that free dietary amino acids may induce adverse changes in plasma amino acid patterns.

6633 EFFECTS OF DIETARY LACTOSE AND A LACTASE PREPARATION ON THE INTESTINAL ABSORPTION OF CALCIUM AND MAGNESIUM IN NORMAL INFANTS. *(E.)*

Kobayashi, A.; Kawai, S.; Ohbe, Y.; Nagashima, Y. (Natl. Children's Hosp., Taishido 3-35-31, Setagaya Ku, Tokyo, Japan). *Am. J. Clin. Nutr.* 28(7):681-683, 1975.

The effects of dietary lactose and the administration of a lactase preparation on intestinal absorption of calcium and magnesium were studied. Fecal excretion of calcium and magnesium was measured in 15 healthy infants (age range, 2-8 months), divided into three groups receiving: a proprietary milk (eight infants); a lactose-free milk (four); and a proprietary milk plus a lactase preparation (three). The mean percent absorption of calcium in the first group was 60.4%, and of magnesium, 57.7%. Infants in the second group showed a significantly reduced mean absorption of both calcium and magnesium (36.5% and 39.3%, resp.) compared to the first group. The mean absorption of calcium and magnesium in the third group

(71.9% and 80.9%, resp.) was enhanced compared to the other two groups. A stimulating effect of dietary lactose on the intestinal absorption of both calcium and magnesium is suggested.

6634 ANALOG MODEL OF KINETICS OF CALCIUM IN HEALTHY SUBJECTS DURING ALIMENTARY Ca ABSORPTION.

(E.) Brodan, V.; Hajek, M.; Kocian, J. (Inst. Clinical Experimental Medicine, Prague, Kre 14622, Budejovicka 800, Czechoslovakia). *Comput. Biol. Med.* 4(3-4):257-267, 1975.

Short-term changes which take place under the acute transient impairment of calcium during alimentary Ca absorption were studied in healthy 20- to 22-yr-old men. Over the course of several months, all subjects were given ^{47}Ca as CaCl$_2$ by the i.v. (10 µCi in 1 ml saline) and p.o. (30 µCi in 100 ml of distilled water) routes; in addition, 30 µCi of ^{47}Ca was administered p.o. as CaCl$_2$ along with 10 mg/kg of nonlabeled Ca as CaCl$_2$ in 100 ml of distilled water. The subjects were fasted prior to Ca administration and blood was drawn 0-300 min after administration to determine the blood calcium level and plasma Ca activity. Based on the results, an analog model of the kinetics of calcium in the organism was constructed. The model was composed of a system of ordinary simultaneous differential equations which were resolved on an analog computer. The four-compartment model is characterized by six rate constants, by the ratio of plasma volume to the extravascular compartment of extracellular fluid, and by three regulatory relations. The first three rate equations describe the short-term kinetics of inactive Ca during alimentary absorption; the others describe the kinetics of ^{47}Ca under the same conditions. The regulatory relations between the digestive tract and plasma reduce the percentage of Ca absorption when its supply is increased. The proportional and integrating regulatory relations between the Ca pool in the extracellular fluid and the rapidly exchangeable Ca pool (particularly in the skeleton) affect the exchange of Ca between these two compartments. The back flow of Ca from the plasma into the bowel is important in the normalization of disturbed plasma calcium level after Ca injection or ingestion. This model is conceived as one of the steps leading toward an accurate mathematical analysis of the complex processes involved in the maintenance of calcium homeostasis in the organism.

6635 CALCIUM AND STRONTIUM TRANSFER THROUGH THE INTESTINAL WALL IN 6- AND 26-WEEK OLD RATS.

(E.) Stacic, M.; Gruden, N. (Institut za medicinska istrazivanja i medicinu rada Jugoslavenske akademije znanosti i umjetnosti, Zagreb). *Arh. Hig. Rada Toksikol.* 25(4):423-426, 1974.

The effects of age on the transport of calcium and strontium through different segments of the intestine were studied in 6- and 26-week-old female albino rats. Everted sacs were constructed from the duodenum, jejunum, and ileum of the fasted animals and were incubated with modified Krebs-Ringer solution containing 10 µCi of carrier-free ^{45}Ca or ^{85}Sr (only in the outside solution) and either calcium or strontium chloride (0.5×10^{-4} M). The activity of each marker was determined in the serosal and mucosal solutions and in the intestinal segments. Calcium and strontium transport in the duodenum was diminished in the older rats, the effect of age being most pronounced in the case of Ca. Strontium transport through the distal portions of the intestine was significantly greater than through the duodenum in the older animals. Although calcium was absorbed to a lesser extent than strontium in all animals, the difference was more pronounced in the younger rats. The retention of calcium and strontium was significantly greater in the duodenal wall of the younger rats; however, the biggest difference between calcium and strontium retention in the younger animals occurred in the duodenal segment. The data confirm previous observations that the absorption and transport of calcium in the duodenum diminish with age.

6636 CALCIUM ABSORPTION BY INTESTINE: STIMULATION IN VITAMIN D-DEFICIENT NEPHRECTOMIZED RATS BY Solanum glaucophyllum.

(E.) Walling, M. W.; Kimberg, D. V. (Harvard Medical Sch. Boston, Mass, 02215). *Gastroenterology* 69(1):200-205, 1975.

Vitamin-D deficient male Holtzman rats were used to study the effects of nephrectomy and a diet containing *Solanum glaucophyllum* on calcium absorption. A low-calcium diet was fed for seven weeks, and two days prior to death all rats were fed a low salt diet to minimize effects on renal insufficiency. Twenty-four hr prior to death the rats were subjected to either a sham operation or total bilateral nephrectomy. Immediately after surgery either 1.0 ml of isotonic saline or acqueous *Solanum* extract was given i.p. Duodenal calcium transport was studied *in vitro* using ^{45}C as tracer in modified Ussing-flux chamber apparatus. Plasma calcium, magnesium, phosphorus, creatinine, and alkaline phosphatase were measured. Prior administration of *Solanum* extract (250 mg dry leaf) increased active absorption 6.2-fold in sham operated, vitamin-D deficient rats and 4.5-fold in nephrectomized animals. Serosal to mucosal flux of calcium and tissue conductance was unchanged by any experimental condition. *Solanum* extract elevated plasma calcium, magnesium, and phosphorus levels but depressed alkaline phosphatase levels compared with controls. Nephrectomy increased plasma magnesium and creatinine but depressed calcium and alkaline phosphatase levels in both control and *Solanum*-treated animals. The data demonstrates that *S. glaucophyllum* leaf contains a water-soluble substance which stimulates active calcium absorption by the duodenum and can effect absorption without the influence of renal tissue. The biological action of *S. glaucophyllum* apparently bypasses the normal means of regulating calcium absorption.

6637 COMPARATIVE STUDIES OF THE INTESTINAL ABSORPTION OF (^{3}H)PTEROYLMONOGLUTAMATE AND (^{3}H)PTEROYLHEPTAGLUTAMATE IN MAN.

(E.) Godwin, H. A.; Rosenberg, I. H. (Baylor Coll. Medicine, Houston, Tex.). *Gastroenterology* 69(2):364-373, 1975.

The absorption of synthetic ^{3}H-pteroylheptaglutamate (folate) was studied quantitatively in 11 normal volunteers and compared with absorption of synthetic ^{3}H-pteroylglutamic acid (folic acid) absorption. After an overnight fast, a venous blood specimen was taken, and the bladder was voided. Each subject was given p.o. 0.6 µM of either one of the labeled folates. Venous blood samples were taken at 30 min and at 1, 2, 3, 4, and 5 hr. Total urine collections were taken at 0 to 4, 8 to 12, 12 to 24 and 24 to 48 hr. After the first 4 hr of testing, fasting was ended and 15 mg of unlabeled folic acid was given i.m. to flush absorbed folate from the tissues and to maximize urinary recovery. In three subjects, tests were repeated after 3 to 4 days. Urine was analyzed by chromatography and electrophoresis; radioactivity of urine and plasma was determined by scintillation counting. Following the dose of folic acid, total urinary excretion of radioactivity over 48 hr was 70.8%. After the dose of folate, urinary radioactivity excretion was 56.1%. Results were reproducible in two patients given repeated tests. Time patterns of urinary excretion of radioactivity were identical for both folic acid and folate. About 5% appeared during the first four hr. After flushing, 50% of the urinary radioactivity appeared during the following four hr. About 20% appeared after 8 to 12 hr, 15% after 12 to 24 hr, and 90% total for 25 hr. After 24 hr, excretion ranged from 1.4 to 19.6%. A second flush raised the excretion of folate, but not of folic acid. Mean stool excretion over three- or four-day collection periods were 37.7% for folate and 24.4% for folic acid. Elevated plasma radioactivity was detectable 30 min after the dose of either folic acid or folate. Peak activity occurred at 1 hr and 2 hr, resp. Flushing caused a marked rise from displaced extravascular folate, whichever drug was used. The label in the serum was attached to monoglutamyl folate. Presence of free folate was demonstrated by assay with *Lactobacillus casei*. Intact folic acid polyglutamates were not demonstrable in the serum. Analysis of urine showed that 67 to 85% of the radioactivity in 4 to 8 hr migrated with standard pteroylmonoglutamates. It is concluded that synthetic folate is absorbed efficiently, but not as well as synthetic folic acid.

6638 MECHANISM AND SITE OF SMALL INTESTINAL ABSORPTION OF α-TOCOPHEROL IN THE RAT.

(E.) Hollander, D.; Rim, E.; Muralidhara, K. S. (Dept. Medicine, Wayne State Univ., Detroit, Mich. 48201). *Gastroenterology* 68(6):1492-1499, 1975.

The mechanism of intestinal absorption of α-tocopherol and the regional differences of its absorption by the small intestine were studied using male Sprague-Dawley rats. Everted small bowel sacs were incubated in a micellar medium. The mean absorption rates of the vitamin at 300 µM incubation solution concentration by proximal, medial, and distal small bowel segments were 2.2, 3.4, and 2.0 nM/min/100 mg, resp. The rate of absorption was not changed by the addition of 2,4-dinitrophenol, sodium azide, or potassium cyanide to the incubation medium. A linear increase in the absorption rate was achieved by stepwise increase in incubation solution tocopherol concentration up to 1200 µM. In all experiments, the rate of absorption of the vitamin by the medial portion of the small intestine was significantly higher than the rate of absorption of the vitamin by the proximal and distal small bowel segments. Transmural transport of the vitamin into the serosal compartment did not occur. Accumulation of the vitamin in the submucosal lymphatic spaces was confirmed by autoradiographic examination of the tissue after incubation. It is concluded from these studies that the absorption of α-tocopherol by the rat small intestine is a passive diffusion process taking place at the highest rate in the medial portion of the small intestine.

6639 TRANSPORT OF AMYLASE ACROSS THE APICAL MEMBRANE OF THE PANCREATIC EXOCRINE CELLS. QUANTITATIVE ANALYSIS OF ZYMOGEN GRANULES.

(E.) Dandrifosse, G.; Simar, L. (Lab. General Comparative Biochemistry, Univ. Liege, Place Delcour, 17 B-4000 Liege, Belgium). *Pfluegers Arch.* 357(3/4):361-368, 1975.

A study is presented disproving the possibility that some types of zymogen granules, ready for secretion, are destroyed by homogenization or centrifugation processes, leading to the presence of amylase in the agranular fraction of the cell. Slices were prepared from the pancreas of pigeons which had been fed *ad libitum* or fasted for 24 hr. One slice was fixed for electron microscopy; the others were homogenized and centrifuged. The number of zymogen granules (N_v) and their surface density (S_v) were higher in slices derived from starved pigeons (315/mm^3 and 15 x 10^{-4} cm^2/cm^3, resp.) than the number in slices from fed animals (60/mm^3 and 1.8 x 10^{-4}, resp.). There was no significant difference noted in the isolated subcellular fractions compared to whole slices: 334 and 63/mm^3 for the N_v; and 12.7 x 10^{-4} and 1.6 x 10^{-4} cm^2/cm^3 for the S_v of fasted and fed pigeons, resp. These data support previous suggestions that amylase can be transported molecule by molecule across the intact apical membrane of pancreatic exocrine cells.

6640 TRANSPORT OF DEUTERIUM OXIDE ACROSS ISOLATED RAT SMALL INTESTINE.

(E.) Bywater, R. J.; Fisher, R. B.; Gardner, M. L. G. (Univ. Edinburgh Medical Sch., Teviot Place, Edinburgh, EH8 9AG, Scotland). *J. Physiol. (Lond.)* 249(3):591-600, 1975.

The transport of deuterium oxide from a luminal perfusate containing 1% D_2O was studied in isolated perfused intestinal segments from anesthetized female rats. The lumen was perfused with bicarbonate saline medium containing glucose (5 mg/ml, 28 mM). After allowing the luminal conditions to stabilize, serial collections of the serosal secretion were made over 2-min periods. The deuterium oxide concentrations in the secretion samples and luminal perfusate were determined, and the results were analyzed using a digital computer program. The kinetics of the appearance of D_2O in the intestinal secretion fitted well into a single exponential function, the steady-state concentration of D_2O in this secretion not differing significantly from the concentration in the luminal perfusate. The total tissue water contained D_2O at a concentration which averaged 5% lower than that in the luminal perfusate. There was no evidence to suggest discrimination in transport across the intestinal mucosa between H_2O and D_2O. The kinetics of wash-in of D_2O to the intestinal secretion indicated that the ratio of flux out of the lumen to reflux back into the lumen was 1.38:1.

6641 EFFECT OF ETHANOL ON SODIUM-DEPENDENT GLUCOSE TRANSPORT IN THE SMALL INTESTINE OF THE HAMSTER.

(E.) Dinda, P. K.; Beck, I. T.; Beck, M.; McElligott, T. F. (Hotel Dieu Hosp., Kingston, Ontario, Canada K7L 3H6). *Gastroenterology* 68(6): 1517-1526, 1975.

The effects of ethanol on the transmucosal potential difference, water and glucose transport, and intracellular electrolyte concentration of the small intestine were studied in isolated segments from female hamsters. Three series of experiments were performed. Intestinal preparations were all incubated in Krebs-Ringer bicarbonate solution containing 10 mM of glucose (control). Series 2 also contained 300 mM of ethanol (1.28 g/100 ml), and series 3, 450 mM of ethanol (2.07 g/100 ml). The presence of ethanol caused an inhibition of the net transport of water and glucose, a decrease in intracellular water content, and an increase in intracellular sodium and potassium concentrations. The intracellular glucose concentration, however, decreased in the presence of ethanol. In the series 3 experiments there was also a significant inhibition of transmucosal potential difference, estimated glucose metabolism and both unidirectional (mucosal to serosal and serosal to mucosal) fluxes of sodium. The net flux of sodium to the serosal side did not decrease significantly. It is suggested that the ethanol-induced reduction in glucose transport could be the result of an interference with the carrier-mediated coupled entrance of glucose and sodium across the brush border.

6642 CATECHOLAMINE EFFECTS ON CYCLIC AMP LEVELS AND ION SECRETION IN RABBIT ILEAL MUCOSA.

(E.) Field, M.; Sheerin, H. E.; Henderson, A.; Smith, P. L. (Harvard Medical School, Boston, Mass. 02215). *Am. J. Phys.* 229(1):86-92, 1975.

The effects of catecholamines on cyclic-AMP (cAMP) and on cAMP-mediated ion transport processes in rabbit ileal mucosa were studied. New Zealand white male rabbits weighing 2-3 kg were used as tissue source. The base-line cAMP level was not affected by epinephrine, norepinephrine, or isoproterenol. Propranolol did not enhance the lowering trend produced by epinephrine on theophylline-augmented cAMP levels indicating that adenylate cyclase-coupled β-adrenergic receptors are not present in significant numbers in ileal mucosa. An increase in cAMP level produced by cholera toxin was reversed by epinephrine and norepinephrine; this reversal was prevented by phenoxybenzamine. Epinephrine partially reversed the increase in cAMP levels produced by prostaglandin E_1 indicating that the inhibitory effect is nonspecfic. In the presence of epinephrine alone there was substantial and equal net absorptive fluxes of Na and Cl ions, a low short-circuit current (SCC), high conductance, and a residual ion flux close to zero indicating enhancement of NaCl absorption and inhibition of HCO_3 secretion. In the presence of theophylline, cAMP or cholera toxin, epinephrine produced a decrease in SCC and an increase in conductance. The effects of α-adrenergic stimuli on intestinal ion transport may not be primarily the result of changes in cAMP levels. Changes in ion transport cannot be safely inferred from changes in cAMP levels of whole mucosa and *vice versa*.

6643 EFFECT OF HORMONES ON PANCREATIC MACROMOLECULAR TRANSPORT.

(E.) Singh, M.; Webster, III, P. D. (Veteran's Administration Hosp., Augusta, Ga.). *Gastroenterology* 68(6):1536-1542, 1975.

The effects of acute and chronic administration of cholecystokinin-pancreozymin (CCK-PZ), pentagastrin and secretin on pancreatic macromolecular synthesis and secretion were studied *in vitro*. Pancreatic slices were prepared from male Sprague-Dawley rats. Pooled slices were pulse-labeled with L-[^{14}C]phenylalanine (10 μCi, 22 μM) and migration of ^{14}C-labeled proteins was studied by "chase" incubation for 15, 30, 60 and 120 min. After incubation of control and drug-treated pancreatic slices, subcellular particles were isolated by differential centrifugation. Specific activity of ^{14}C-labeled proteins was determined in subcellular fractions involved in transport and secretion of digestive proteins. CCK-PZ and pentagastrin, used *in vitro*, did not alter the intracellular transport of proteins, although secretion was enhanced. Chronic stimulation of the pancreas with CCK-PZ did not alter the rates of intracellular transport. It is concluded that secretin has no effect on the intracellular transport and secretion of pancreatic macromolecules in acinar cells.

6644 THE EFFECT OF OUABAIN ON ION TRANSPORT ACROSS ISOLATED SHEEP RUMEN EPITHELIUM.

(E.) Harrison, F. A.; Keynes, R. D.; Rankin, J. C.; Zurich, L. (Agricultural Res. Council Inst. Animal Physiology, Babraham, Cambridge, CB2 4AT England). *J. Physiol.* 249(3):669-677, 1975.

The electrical properties of sheep rumen epithelium were altered by ouabain treatment and changes in the unidirectional and net fluxes of Na, K, and Cl were studied. Epithelial strips were mounted in two identical chambers and bathed in unlabeled Ringer and ouabain solution for 30 min (until tissue and Ringer solution reached equilibrium). In the third 30 min period after ouabain treatment, the net flux of Na from the lumen to the blood side of the epithelium was reduced to zero (5×10^{-5} M or 10^{-4} M of ouabain), the net flux of K from the blood to the lumen was reduced from 0.34 to 0.13 μM/cm^2/hr (5×10^{-5} M of ouabain), and the net flux of Cl from lumen to blood went from 1.4 to 0.77 μM/cm^2/hr (5×10^{-5} M of ouabain). The results suggest the existence of a K and Cl pump which is independent of Na transport in sheep rumen epithelium.

6645 MERCURIAL PERTURBATION OF BRUSH BORDER MEMBRANE PERMEABILITY IN RABBIT ILEUM. *(E.)*

Stirling, C. E. (Univ. Washington Sch. Medicine, Seattle, Wash. 98195). *J. Membr. Biol.* 23(1):33-56, 1975.

The effects of organic mercury and p-chloromercuriphenyl sulfonic acid (PCMBS) on amino acid and sugar influx across the brush border, Na^+ permeability, and the ileal uptake of ^{203}Hg-PCMBS were studied *in vitro* using tissues from female New Zealand white rabbits. Both Hg^{++} and PCMBS at mM concentrations reduced the mucosal entry of sugars and amino acids to 80 to 90% of control values within several min. Based on the 50% levels of inhibition, Hg^{++} was 10- and 20-fold more potent than PCMBS in blocking sugar and amino acid influx, resp.; both systems were equally sensitive to Hg^{++}. The ileal accumulation of ^{203}Hg-PCMBS demonstrated a pattern of progressive uptake which showed no tendency toward saturation. This suggested appreciable epithelial entry with prolonged exposures (>30 min at 1 mM). At similar dose levels, Hg^{++} and PCMBS had no significant effect on mucosal Na^+ permeability. The inhibition of sugar and amino acid influx was not affected by washes in choline-salt solutions, but dithiothreitol (10 mM) reversed Hg^{++} and PCMBS inhibition by 40 and 100%, resp. Alanine and galactose influx kinetics measured at concentrations of 0 to 100 mM exhibited a linear or diffusional entry component in addition to the usual saturable component for both control and Hg^{++}-treated ileum. The presence of a diffusional term in the flux equation resulted in two sets of parameters giving nearly equal fits to these measurements. This ambiguity could be resolved by determining the change in diffusional entry with Hg^{++} treatment. A 20-min exposure to 0.5 mM of Hg^{++} resulted in an increase from 0.050 and 0.045 to 0.064 and 0.070 cm/hr in the coefficient of diffusional entry for alanine and galactose, resp. Thus, Hg^{++} appears to cause a decrease in J_{max} and little change in K_m for both transport mechanisms. This analysis has general bearing on kinetic measurements of transport in which passive fluxes are comparable to those mediated by specific pathways.

6646 ISOOSMOTIC TRANSPORT OF FLUID ACROSS THE HAMSTER SMALL INTESTINE IN THE PRESENCE OF PHLORIZIN-INDUCED INHIBITION OF SUGAR TRANSPORT.

(E.) Dinda, P. K.; Beck, M.; Beck, I. T. (Hotel Dieu Hosp., Kingston, Ontario, Canada K7L 3H6). *Can. J. Physiol. Pharmacol.* 53(3):375-382, 1975.

The effect of partial inhibition of active glucose transport on isoosmotic transport of fluid was studied in intestinal segments isolated from female hamsters. Each segment was incubated in Krebs-Ringer bicarbonate containing 10 mM of glucose and: 1) no other agent (isotonic control); 2) 5 x 10^{-5} M of phlorizin (isotonic); 3) 50 mM of mannitol (hypertonic control); and 4) 50 mM of mannitol plus 5 x 10^{-5} M of phlorizin (hypertonic). Incubations were carried out for 60 min at 37 C. The absorbate was isoosmotic with the mucosal solution in all groups. The addition of phlorizin to the isotonic mucosal solution caused a reduction in the concentration of glucose in the absorbate (57.7 mM and 37.6 mM, resp., for groups 1 and 2). Isotonic segments had a significantly higher concentration of sodium (121.1 mM) and potassium (4.0 mM) compared to isotonic controls (115.2 mM and 3.2 mM, resp.). The concentration of both glucose and the electrolytes increased in hypertonic solutions. The addition of phlorizin in group 4 caused a decrease in glucose concentration (41.8 mM) compared to the hypertonic control (66.2 mM). The presence of phlorizin or mannitol significantly depressed the potential difference (group 1, 10.7; group 2, 6.4; group 3, 8.9; and group 4, 5.8 mV). Glucose transport/g dry tissue was depressed in group 2 ($p < 0.05$). Glucose, fluid and electrolyte transport were significantly decreased in groups 3 and 4. The magnitude of inhibition in fluid and electrolyte transport produced by mannitol alone (49.2% for fluid, 44.2% for sodium, and 46.5% for potassium) was similar to that produced by mannitol and phlorizin together (44.4, 32.5 and 19.0%, resp.). These data suggest that phlorizin inhibits sodium movement through the electrogenic pathway, but increases the transport of this ion through the electrogenic route. It is further suggested that isoosmotic fluid transport is an inherent property of the small intestine.

6647 A Na^+-INDEPENDENT, PHLORETIN-SENSITIVE MONOSACCHARIDE TRANSPORT SYSTEM IN ISOLATED INTESTINAL EPITHELIAL CELLS.

(E.) Kimmich, G. A.; Randles, J. (Univ. Rochester, Sch. Medicine and Dentistry, Rochester, N.Y. 14642). *J. Membr. Biol.* 23(1): 57-76, 1975.

A monosaccharide transport system in addition to the active Na^+-dependent system characteristic of the brush border surface of vertebrate intestinal tissue has been identified in isolated chick (6-8 wk old) intestinal epithelial cells. The accumulation of ^{14}C-3-O-methylglucose (1 mM) by the isolated cells was studied as a function of time under conditions in which the cells were separated from the incubation medium by centrifugation or millipore filtration. The effects of Na^+, D-glucose, phlorizin (10-200 μM), phloretin (10-200 μM), valine (1 mM), leucine (25 mM), fructose, mannose, glucose, and/or 2-deoxyglucose (all sugars at 50 mM) on this accumulation were also studied. The data obtained after separation by centrifugation and millipore filtration were similar. A true unidirectional flux of 3-O-methylglucose in the isolated cells was demonstrated. It was dependent on Na^+, inhibited by phlorizin, and inhibited by the inclusion of glucose in the medium. The total Na^+-independent 3-O-methylglucose entry rate was inhibited by phloretin in concentrations as low as 10 μM, but this compound had no effect on the Na^+-dependent entry system. In contrast, phlorizin had no effect on the Na^+-independent system. Phloretin had no effect on the unidirectional flux of valine, although leucine inhibited the entry of valine by 85% under the same conditions. The phloretin-sensitive entry rate was inhibited by glucose and galactose, but not by ketohexose or fructose; xylose and mannose were mildly inhibitory, while 2-deoxyglucose was the most effective inhibitor studied. Phloretin selectively blocked the efflux of sugar from cells which had accumulated sugar to a steady state; thus, a normal steady-state sugar gradient of seven- to eight-fold was transformed to a new steady-state gradient of greater than eight-fold. The data indicate that the monosaccharide transport system functions only in a facilitative diffusion manner so that it moves monosaccharide across the cell membrane along a downward chemical gradient. The locus of the system is tentatively ascribed to the serosal cell surface, where it would serve for monosaccharide transfer between enterocytes and the lamina propria of the villi.

6648 PYRIDOXINE TRANSPORT ACROSS THE TURTLE, RAT AND RABBIT INTESTINES. *(Eng.)* Hajjar, J. J.; Nassar, K. (Sch. Med., American Univ. Beirut, Beirut, Lebanon). *Comp. Biochem. Physiol.* [*A*] 52: 389-393, 1975.

The intestinal transport of pyridoxine was examined *in vitro* using tissues from fresh-water turtles *(Testudo graeca)*, Sprague-Dawley rats, and rabbits. Turtle and rabbit tissues were mounted between two lucite chambers and equal concentrations of pyridoxine were placed in both the serosal and mucosal solutions; ^{3}H-pyridoxine was added to one side only and its rate of appearance on the opposite side was measured in the presence and absence of alanine. In other experiments, turtle mucosal strips were incubated for 2 min in solution containing labeled and unlabeled pyridoxine and ^{14}C-inulin, after which the ^{3}H and ^{14}C contents in the tissue and test solution were determined. The steady-state uptake of pyridoxine by turtle, rat and rabbit mucosal strips was simularly determined after 60 min of incubation in labeled and nonlabeled pyridoxine and ^{14}C-inulin. The mucosal-to-serosal and serosal-to-mucosal fluxes of pyridoxine were equal in the presence of equal low concentrations of pyridoxine in the serosal and mucosal solutions; at higher concentrations, however, the fluxes were not solely explainable on the basis of simple passive diffusion. The unidirectional fluxes of pyridoxine were more than two-fold greater in the turtle than in the rabbit and the fluxes were not influenced by the presence of alanine in the medium. The initial uptake rate of pyridoxine by the turtle mucosal strips was linear with physiological medium pyridoxine concentrations, and curvilinear with concentrations above 5mM. Pyridoxine did not accumulate in the epithelial cells of the turtle, rabbit, or rat intestine. The intracellular to extracellular distribution ratio and low vitamin concentration was close to unity, but at higher concentrations, the intracellular pyridoxine levels remained lower than the extracellular levels in spite of extended incubation periods. Amino acids had no effect on the steady-state uptake of pyridoxine by the epithelial cells in any species. The results indicate that pyridoxine at low concentrations is transported by simple passive diffusion, but that at higher concentrations the vitamin limits its own permeation through the cell membrane. The data do not support the possibility of a complete interdependence between transport of the vitamin and amino acids.

6649 EFFECTS OF SODIUM ON SOLUTE TRANSPORT BETWEEN COMPARTMENTS IN INTESTINAL MUCOSAL EPITHELIUM. *(E.)* Boyd, C. A. R.; Cheeseman, C. I.; Parsons, D. S. (Univ. Oxford, Dep. Biochemistry, South Parks Road, Oxford OX1 3QU, England). *Nature* 256(5520):747-749, 1975.

The effects of sodium on the transfer of solute between compartments in the intestinal mucosal epithelium were studied using a vascularly perfused preparation of frog intestine. Removal of Na from the vascular bed inhibited solute transfer into the blood and decreased the extracellular space. Addition of Na to the vascular perfusate increased the rate of efflux of intracellular 3-O-methyl-D-glucose (3-O-MeG) into the vascular bed. Furthermore, after Na-free perfusion of the lumen and vascular bed, the return of Na to the lumen increased the rate of efflux of 3-O-MeG from the cells into the vascular bed. The total quantity of 'intracellular' 3-O-MeG loaded into the cells from the circulation increased by 43% on addition of Na to the vascular perfusate. When the brush-border amino acid uptake systems were saturated with 10 mM of relevant amino acids, the removal of Na from the vascular perfusate resulted in a large, but reversible inhibition (67%) of the transfer of amino acids initially taken up in the form of peptide into the vascular bed. The uptake of peptide from the intestinal lumen was independent of Na in the lumen. 2-Deoxy-D-glucose (2-DOG) appeared at a faster rate in the effluent from the lumen than 3-O-MeG when the rate of appearance of the two compounds from constant vascular infusion was studied. A pulse of 10 mM glucose in the lumen resulted in a sudden increase in the appearance of both sugars, but the effect was proportionately 5-fold greater for 3-O-MeG. The subsequent addition of phlorizin to the lumen increased the rate of appearance of 3-O-MeG but had no effect on the movement of 2-DOG. It is concluded that in addition to its role in membrane transport, Na also expands extracellular spaces within the intestinal mucosa with consequential effects on the clearance of transported substrates from these spaces. The clearance may be forward into the blood stream or backward into the unstirred layer in the lumen. The requirement for Na for this purpose can be completely filled by its presence in the vascular bed, but only partially fulfilled by the addition of Na to the lumen when Na is absent from the vascular perfusate.

6650 EFFECT OF SUCROSE FEEDING ON THE INTESTINAL TRANSPORT OF SUGARS IN TWO STRAINS OF RATS. *(E.)* Reiser, S.; Michaelis, IV, O.; Putney, J.; Hallfrisch, J. (Nutrition Inst., Agricultural Res. Service, United States Dept. Agriculture, Beltsville, Md. 20705). *J. Nutr.* 105(7):894-905, 1975.

The effect of high-sucrose diets on the rate of intestinal absorption of dietary sugars in Wistar and carbohydrate-sensitive BHE rats was studied. Control rats were fed a stock diet and experimentals, a diet containing 65% sucrose. Determinations were made of immunoreactive insulin from sera obtained after 17 days. After 7-12 weeks of the diet, rats were killed and small intestines and livers were removed. Sucrose-fed rats of both strains showed large and significant increases in the rates of glucose, α-methylglucose, fructose and sucrose transport. The transport of galactose, maltose and lactose did not show consistent increases due to sucrose feeding. Although the magnitude of the increases in sugar transport due to sucrose feeding was only slightly greater in BHE than in Wistar rats, the former tended to exhibit a greater rate of sugar transport when fed either diet. Increases in serum insulin levels were observed in the sucrose-fed rats of both strains and in BHE controls. Lipogenic enzyme activity was greatly increased as a result of sucrose feeding. BHE rats, however, did not show greater levels of enzyme activity than Wistar rats. Liver lipids were increased in both the Wistar and the BHE sucrose-fed rats and in BHE rats fed the stock diet. These data diminish the possibility of a nonspecific transport effect due to differences in the availability of nutrients from either the stock or the sucrose diets.

6651 TRANSMUCOSAL TRIGLYCERIDE TRANSPORT RATES IN PROXIMAL AND DISTAL RAT INTESTINE IN VIVO. *(E.)* Wu, A.; Clark, S. B.; Holt, P. R. (Saint Luke's Hosp. Center, New York, N.Y. 10025). *J. Lipid Res.* 16(4):251-257, 1975.

Direct measurements of fractional triglyceride output rates in proximal and distal intestine, using direct regional perfusion under conditions where uptake from the lumen was complete, were utilized to test a mathematical model of lipid uptake rates. Male Wistar rats received four cannulas: abdominal thoracic duct for lymph collection; bile and pancreatic juice diversion; and two intraintestinal infusion cannulas inserted into either the duodenum (proximal) or the intestinal midpoint (distal). Infusion of donor bile and pancreatic juice (0.75 ml/hr) was begun immediately after surgery and was continued without interruption. A continuous infusion of glucose-KCl-NaCl was also administered (2.293 ml/hr for 24 hr, then 1.146 ml/hr), except during lipid infusion. Infusions of [^{14}C]triolein (1.146 ml/hr) were made for 6 hr, 48 and 72 hr after surgery. The total recovery of [^{14}C]triolein in both proximal and distal groups was more than 90% on both days. The proximal output rate reached a steady state at 3 hr after the start of infusion and plateaued at 98% of the infusion rate. Output from the distal intestinal wall was much slower initially and leveled off at 85% after 5 hr of infusion. Absorption from the lumen approached 100% in both proximal and distal intestine when measured at 3 and 6 hr. The mean half-life for the distal intestine was about 35% greater than that for the proximal intestine. The total ^{14}C-labeled lipid accumulated in the intestinal wall at the end of the 6-hr infusion period was greater in distally infused animals (22.3% of the total infused lipid compared to 13.9% in proximal intestine). Thin-layer chromatography of the tissue [^{14}C]lipid showed more than 90% of the label was in triglyceride in both proximal and distal intestine. The fractional turnover rate of the labeled lipid through the intestinal wall *in vivo* was about 40% slower in distal compared with proximal halves of rat intestine. These data support previous findings suggesting that slower distal transmucosal lipid transport is responsible for the higher tissue lipid accumulation in distal compared with proximal intestine when uptake rates are maximal.

6652 BILE CONSTITUENTS IN BLOOD AND LYMPH DURING BILIARY OBSTRUCTION. I. THE DYNAMICS OF ABSORPTION AND TRANSPORT OF IONS AND COLLOID MOLECULES. *(E.)* Szabo, G.; Magyar, Z.; Jakab, F. (Pharmacological Res. Inst., H-1430 Budapest, Hungary). *Lymphology* 8(2):29-36, 1975.

An analysis of the transport of bile constituents was made by the introduction of known amounts of Na^{125}I and ^{131}I-albumin into the biliary tract at a constant rate. The iodide ion (5 μCi) and labeled albumin (5 μCi) were infused into mongrel dogs *via* the common bile duct at pressures of 20 to 25 and 40 mm Hg, at rates of 0.1 to 0.3 or 1.1 ml/min. One group of dogs also received a single i.v. injection of the iodide ion (5 μCi). At 40 mm Hg, the amounts of the iodide ion and the labeled albumin were 73% and 68%, resp. At 25 mm Hg, the difference between ion transport and colloid molecule transport increased: values were 80% for the iodide ion and 52.5% for the labeled albumin. At 40 mm Hg, the lymphatic concentration of labeled albumin reached 36% of its concentration in the infusion fluid. It is concluded that at increased pressure fluid leaks first from the biliary ducts into the Mall's spaces. Due to water absorption and ion and small molecule diffusion into the capillaries, the concentrations of proteins or protein-bound molecules in this part of the hepatic interstitial fluid increases, reflected in their high concentration in the lymph. If bile pressure rises further, fluid also leaks into the spaces of Disse, leading to a bulk flow of solvent and solutes into the sinusoids and to the near disappearance of differences in the venous transport of ions and colloids.

6653 BILE CONSTITUENTS IN BLOOD AND LYMPH DURING BILIARY OBSTRUCTION. II. THE ABSORPTION AND TRANSPORT OF BILE ACIDS AND BILIRUBIN. *(E.)* Szabo, G.; Magyar, Z.; Szentirmai, A.; Jakab, F.; Mihaly, K. (Pharmacological Res. Inst., H-1430, Budapest, Hungary). *Lymphology* 8(2):36-42, 1975.

An attempt was made to calculate the absolute amounts of bile acids transported by the lymphatic and venous routes. Total bilirubin and bile acid concentrations were made in mongrel dogs who had received a cannula in the thoracic duct, as well as cystic and common bile duct ligation. Lymph samples were collected for 8 hr in 2-hr periods, and subsequently up to 24 hr in two 8-hr periods. Lymphatic concentrations of both bilirubin and bile acids attained maximum levels between the fourth and sixth hr (4.82 mg% for bilirubin, while the normal value was 0.20 mg%; 116 μM/l for bile acids, while the normal value was 1 μM/l). Lymphatic concentrations remained above plasma concentrations during the whole 24 hr. The amounts of both substances transported by the lymph system rose steadily for 6 and 8 hr, resp., and after 2 hr of occlusion they exceeded the amounts transported by the venous system. From these data it is suggested that in the first hr after biliary occlusion, the concentration of bilirubin and especially that of bile acid in the interstitial fluid of the liver is near the maximal binding capacity of the proteins present in the same fluid.

6654 DIABETES MELLITUS: CHANGES IN THE TRANSPORT PROPERTIES OF ISOLATED INTESTINAL MICROVILLOUS MEMBRANES. *(E.)* Hopfer, U. (Dept. Biochemistry, Federal Inst. Technology, Zurich, Switzerland). *Proc. Nat. Acad. Sci. USA* 72(6):2027-2031, 1975.

The transport properties of the luminal plasma membranes of small intestinal epithelial cells from normal and diabetic rats were compared. Jejunal and ileal mucosal samples were isolated from rats killed 4-8 days after injection with alloxan (50 mg/kg) or saline solution (control). Accumulation of D-glucose was greater in diabetic membrane segments with the addition of NaCl or NaSCN (1.5 and 2.0, resp., measured as the ratio of maximum over equilibrium uptake of D-glucose) compared with controls (1.1 and 1.4, resp.). Increasing the glucose-independent Na$^+$-conductance of the membrane with monactin (50% ethanolic solution) or gramicidin D reduced the active accumulation of D-glucose by membrane preparations from both control and diabetic rats. Concentrations of both ionophorous antibiotics in the incubation medium of diabetic membrane vesicles could be adjusted so that D-glucose transport was indistinguishable from control membranes not treated with ionophores. It is suggested that the microvillous membranes are a site for the changes which occur in diabetes mellitus. It is further suggested that the change in transport properties of the isolated membranes may explain the simultaneous elevation of active intestinal sugar, amino acid and bile salt transport in intact intestinal tissue.

6655 JEJUNAL AND ILEAL ABSORPTION OF DIBASIC AMINO ACIDS AND AN ARGININE-CONTAINING DIPEPTIDE IN CYSTINURIA. *(E.)* Silk, D. B. A.; Perrett, D.; Clark, M. L. (Saint Bartholomew's Hosp., London, England). *Gastroenterology* 68(6):1426-1432, 1975.

Jejunal perfusion studies with an arginine-containing dipeptide, L-arginyl-L-leucine, were performed in cystinuric patients and normal controls to evaluate the role of the specific dibasic amino acid transport system. Amino acid absorption from the jejunum and ileum of six male homozygous cystinuric patients was assessed and the results were compared with those obtained in sex- and age-matched controls. Solutions containing either glycine (4.2 mM) plus lysine (4.2 mM) or arginine (1 mM) plus leucine (1 mM) were perfused. Jejunal absorption of L-arginyl-L-leucine was also investigated by perfusion of 1 mM in the jejunum of patients and controls. Both jejunal and ileal absorption of glycine and L-leucine were normal in patients compared to controls, but there was severe impairment ($p < 0.001$) during jejunal and ileal perfusion with L-lysine and L-arginine. The rates of uptake of both L-arginine and L-leucine were similar in both patients and controls during perfusion with the dipeptide. Higher concentrations of L-arginine were detected during perfusion with the dipeptide in cystinuria patients (26.7 μM/100 ml) compared with controls (7.6 μM/100 ml). These data suggest a defect of specific carrier-mediated transport of the dibasic amino acids throughout the whole of the small intestine in patients with cystinuria. It is concluded that specific amino acid transport systems may play an important role during intestinal transport of peptides.

6656 REGIONAL DIFFERENCES IN OXALATE ABSORPTION BY RAT INTESTINE: EVIDENCE FOR EXCESSIVE ABSORPTION BY THE COLON IN STEATORRHEA. *(E.)* Saunders, D. R.; Sillery, J.; McDonald, G. B. (Dep. Medicine, RG-20, Univ. Washington, Seattle 98195). *Gut* 16(7):543-548, 1975.

To elucidate the pathogenesis of enteric hyperoxaluria, the effects of bile salts, calcium, and long-chain fatty acid on the absorption of oxalate and water by the rat intestine were studied *in vivo* using fasted male Sprague-Dawley rats. The animals were anesthetized and jejunal, ileal, and colonic sections were created. The jejunal segments were in the proximal 50 cm of the small intestine; the ileal segments extended orad from a point 5 cm from the ileocecal junction, and the colonic segments were distal to the cecum. Absorption was measured under steady-state conditions during single pass infusions, each intestinal segment serving as its own control. In the jejunum, taurocholate (10 mM), the principle salt in rat bile, depressed the absorption of both oxalate and water. Absorption was not depressed further by Ca^{++} (1 mM) or linoleic acid (2 mM). In the ileum, taurocholate did not inhibit absorption, but linoleic acid depressed the absorption of both oxalate and water. In the colon, taurocholate decreased the absorption of both substances; linoleic acid further depressed the net water transport, but it enhanced the absorption of oxalate. Calcium negated the inhibitory effect of linoleic acid on water transport and the stimulative effect of linoleic acid on oxalate absorption. When a lower concentration of taurocholate (2.5 mM) was infused into the colon, net water transport and oxalate absorption were unaffected by calcium or linoleic acid with calcium. Linoleic acid without calcium depressed net water transport but did not inhibit oxalate absorption. It is concluded that long-chain fatty acids may enhance the absorption of oxalate from the rat colon, an observation which may be relevant to understanding the process of hyperoxaluria in patients with steatorrhea.

6657 EFFECT OF CHANGES IN FEEDING SCHEDULE ON THE DIURNAL RHYTHMS AND DAILY ACTIVITY LEVELS OF INTESTINAL BRUSH BORDER ENZYMES AND TRANSPORT SYSTEMS. *(E.)* Stevenson, N. R.; Ferrigni, F.; Parnicky, K.; Day, S.; Fierstein, J. S. (Rutgers Medical Sch., Piscataway, N.J. 08854). *Biochim Biophys. Acta* 406(1):131-145, 1975.

The diurnal rhythms and daily activity levels of the intestinal glucose-galactose transport, lactase, maltase, sucrase, trehalase, γ-glutamyltransferase, alkaline phosphatase, and leucylnaphthylamide-hydrolyzing systems were studied in male Sprague-Dawley rats maintained on *ad libitum* and restricted (to the period from 2:00 to 4:00 pm daily) feeding regimens. Lighting was constant during the experimental period. The animals were killed at specific times during the seventh day of the study. The protein content of the intestinal mucosal homogenates showed no diurnal rhythmicity and did not vary according to feeding regimen. The various enzymes and transport systems tended to show higher activities at various times between 12:00 P.M. and 12:00 A.M. in the *ad libitum* group, while lower activities occurred at various times between 11:00 A.M. and 9:00 P.M. Leucylnaphthylamide-hydrolyzing activity was reduced until 12:00 A.M. and lactase activity was reduced until 3:00 A.M. In general, there was a 12-hr shift in the activity patterns between the *ad libitum* group and the restricted group. In the latter, higher activity was observed between 12:00 A.M. and 9:00 P.M. for all systems except alkaline phosphatase, which was highest from 6:00 P.M. to 3:00 A.M. Lower activity occurred between 12:00 A.M. and 2:00 P.M. for all systems except the leucylnaphthylamide-hydrolyzing system, which was lower from 3:00 A.M. to 9:00 P.M., and alkaline phosphatase, which was lower from 5:00 A.M. to 5:00 P.M. In comparison with the *ad libitum* group, the restricted group showed decreased leucylnaphthylamide-hydrolyzing activity, similar alkaline phosphatase activity, and increased activities in all other systems. Thus, at certain times of the day, the enzyme and transport system activities were similar in the *ad libitum* and restricted groups, while at other times the activities differed by as much as 341%. The data indicate that correlations between diet and intestinal enzyme or transport activity level can be made with confidence only after both the entire diurnal rhythmicity pattern and the mean daily activity levels have been determined.

6658 THE INFLUENCE OF 2,4-DINITROPHENOL AND L-METHIONINE ON THE CHARACTERISTIC DYNAMICS OF IN VITRO INTESTINAL TRANSPORT OF HISTIDINE. *(It.)* Brucoli, E.; Ceriani, T.; Garbagnati, F.; Schmid, R.; Stefanelli, M.; Ventura, U. (Inst. Human Physiology, Univ. Pavia, Pavia, Italy). *Boll. Sper. Ital. Biol. Sper.* 50(19):1615-1621, 1974.

6659 INTESTINAL ABSORPTION OF β-ESSCINE. *(Ger.)* Eisenburger, R.; Hampel, H.; Hofrichter, G.; Liehn, H. D. (Forschungs laboratorium, Chemisch-Pharmazeutische Fabrik Adolf Klinge & Co., Munich, Germany). *Arzneim. Forsch.* 24(10):1621-1624, 1974.

6660 A TECHNIQUE FOR STUDYING INTESTINAL ABSORPTION AND GUT WALL METABOLISM. *(E.)* Weber, F. L.; Maddrey, W. C.; Walser, M. A.; Hendrix, T. R. (John's Hopkins Univ. Sch. Med., Baltimore, Md.). *Gastroenterology* 68(4):1010, 1975.

6661 IMPORTANCE OF CA^{2+} AND MG^{2+} DURING ABSORPTION OF MICELLAR LIPIDS BY INTESTINE IN VITRO. *(E.)* Strauss, E. W. (Div. Biol. Med. Sci., Brown Univ., Providence, R. I.). *Gastroenterology* 68(4):992, 1975.

6662 INTESTINAL UPTAKE OF GLUCOSE IN PARENTERALLY NOURISHED RATS. *(E.)* Schanbacher, L. M.; Copeland, E. M.; Dudrick, S. J.; Johnson, L. R.; Castro, G. A. (Univ. Texas Med. Sch., Houston, Tex.). *Gastroenterology* 68(4):981, 1975.

6663 MODIFICATION OF PERMEABILITY PROPERTIES OF GASTRIC ANTRUM. *(E.)* Bajaj, S.; Spenney, J. G.; Sachs, G. (Univ. Alabama, Birmingham, Ala.). *Gastroenterology* 68(4):978, 1975.

6664 EFFECT OF ASPIRIN ON CHOLERA TOXIN-STIMULATED INTESTINAL ELECTROLYTE TRANSPORT. *(E.)* Powell, D. W.; Farris, R. K. (Dep. Med., Univ. North Carolina, Chapel Hill, N.C.). *Gastroenterology* 68(4):968, 1975.

6665 EFFECT OF THYROCALCITONIN ON RABBIT JEJUNAL AND ILEAL H_2O AND ELECTROLYTE TRANSPORT. *(E.)* Kisoff, B.; Moore, E. W. (Virginia Commonwealth Univ., Richmond, Va.). *Gastroenterology* 68(4):960, 1975.

6666 EFFECTS OF DIABETES ON DUODENAL AND ILEAL STRONTIUM ABSORPTION IN THE RAT. *(E.)* Miller, D. L.; Schedl, H. P. (Dep. Med., Univ. Iowa, Iowa City, Iowa). *Gastroenterology* 68(4):956, 1975.

6667 THE RELATIONSHIP BETWEEN STARLING FORCES, REGIONAL BLOOD FLOW AND N_a AND H_2O FLUXES IN THE CANINE ILEUM. *(E.)* Mailman, D.; Jordon, K. (Dep. Biol., Univ. Houston, Houston, Texas). *Gastroenterology* 68(4):939, 1975.

6668 CARRIER-MEDIATED TRANSPORT OF BILE ACIDS BY THE LIVER. *(E.)* Reichen, J.; Paumgartner, G. (Dept. Clinical Pharmacology, Univ. Berne, CH-3010 Berne, Switzerland). *Experientia* 31(6):714, 1975.

6669 INHIBITION OF SODIUM AND SODIUM-COUPLED TRANSPORT BY HARMALINE IN THE INTESTINE IN VITRO. *(E.)* Sepulveda, F. V.; Robinson, J. W. L. (Hopital Cantonal, CH-1011 Lausanne, Switzerland). *Experientia* 31(6):714-715, 1975.

6670 THE GASTROINTESTINAL ABSORPTION OF ASPIRIN. INFLUENCE OF ASCORBIC ACID IN HUMANS. *(E.)* Oriani, G. A.; Blanco, C. Del V.; Galmuzzi, G. Giuliani, E.; Colombo, B. M. (Medical Dept., Richardson-Merrell S.p.A., Naples, Italy). *Clinical Trials Journal* 11(2):110-115, 1974.

6671 EFFECT OF SURFACTANTS ON ABSORPTION THROUGH MEMBRANES III. EFFECTS OF DIOCTYL SODIUM SULFOSUCCINATE AND POLOXALENE ON ABSORPTION OF A POORLY ABSORBABLE DRUG, PHENOLSULFONPHTHALEIN, IN RATS. *(E.)* Malik, S. N.; Canaham, D. H.; Gouda, M. W. (Sch. of Pharmacy, Univ. Montana, Missoula, MT 59801). *J. Pharm. Sci.* 64(6):987-990, 1975.

6672 EFFECT OF SURFACTANTS ON ABSORPTION THROUGH MEMBRANES IV: EFFECTS OF DIOCTYL SODIUM SULFOSUCCINATE ON ABSORPTION OF A POORLY ABSORBABLE DRUG, PHENOLSULFONPHTHALEIN, IN HUMANS.

(E.) Khalafallah, N.; Gouda, M. W.; Khalil, S. A. (Faculty of Pharmacy, Univ. of Alexandria, Alexandria, Egypt). *J. Pharm. Sci.* 64(6):991-994, 1975.

See also, 6606, 6613, 6814, 6925, 6926, 6944, 7918.

MOTILITY

6673 LONGITUDINAL CONTRACTIONS IN THE DUODENUM: THEIR FLUID-MECHANICAL FUNCTION.

(E.) Melville, J.; Macagno, E.; Christensen, J. (Iowa Inst. Hydraulic Res., Iowa City, Iowa 52242). *Am. J. Physiol.* 228(6):1887-1892, 1975.

The hypothesis that contractions of the longitudinal muscle layer occur in the duodenum independently of those of the circular muscle layer and that these contractions induce the flow of the duodenal contents was investigated. Segments of duodenum were removed from healthy adult opossums of both sexes and immersed in a bath of Krebs solution with the ends tied to horizontal glass tubes. The segments were photographed during periods of longitudinal muscle contraction when the circular muscle layer appeared inactive. Relative displacements as a function of time were determined based on the movement of India ink spots on the serosal surface. The frequency and velocity of the duodenal slow waves were also recorded under normal illumination and during exposure to high-intensity photography lamps. The frequency of longitudinal oscillation of the marked points on the duodenal segments was 20.5 cycles/min, the longitudinal displacement wave spreading caudad with an average velocity of 3.27 cm/sec. The slow wave frequency in the segments was 17.9 cycles/min with a propagation velocity of 1.63 cm/sec under normal illumination. Under the high-intensity lamps, the frequency increased to 18.9 cycles/min. In a 2-dimensional mechanical model, flow induced by simulated longitudinal contractions was visualized and a theoretical model of axisymmetric flow was made. Based on this model, it is concluded that independent contractions of the longitudinal muscle layer appear driven by the electrical slow waves of the duodenum and that they are capable of inducing a pattern of flow in which the duodenal contents flowed between the core and the periphery of the intestinal conduit.

6674 ULTRADIAN RHYTHMS IN WAKING GASTRIC ACTIVITY.

(E.) Hiatt, J. F.; Kripke, D. F. (Narcotic Treatment Program, 1300 Market St., San Diego, Calif. 92101). *Psychosom. Med.* 37(4):320-325, 1975.

Ultradian rhythms in waking gastric activity were studied in six female and five male young adult volunteers. The subjects were fasted and nasogastric tubes with rubber balloons on the end were inserted to monitor gastric contractions. The electroencephalogram (EEG), electrooculogram (EOG), and electromyogram (EMG) were monitored by a multiplex telemetry transmitter worn in a special cap. The intraluminal gastric pressure records over the 8-hr experimental session showed a tendency for periods of intense gastric contraction to recur at regular intervals. The typical subject showed 4 to 5 cycles in the 8-hr period. The intense contraction periods within these cycles lasted about 18 min and were characterized by an increase in the peak pressure of individual contractions and increases in baseline pressure between contractions. The contraction periods were preceded by gradually increasing activity followed by an abrupt decrease. Although the modal duration of a cycle was 100 min, the cycle was about 200 min in three subjects. There was a tendency for those subjects with elevated scores on the Minnesota Multiphasic Personality Inventory to show poor or absent (12 to 18 cycles/day) rhythms in the gastric recordings. The degree of rhythmicity was inversely correlated with paranoia scores and positively correlated with scores on the Goldberg Scale, which distinguishes psychotic from neurotic processes. The ultradian cycle observed in the waking subjects bore a striking resemblance to previously recorded sleep cycle patterns. The data combined with previous data suggest that both appetitive and consummatory aspects of alimentary function may display ultradian rhythms.

6675 THE INTRINSIC INNERVATION OF THE HUMAN ALIMENTARY TRACT AND ITS RELATION TO FUNCTI

(E.) Bennett, A.; Stockley, L. (King's Coll. Hosp. Medical Sch., London, England). *Gut* 16(6):443-453, 1975.

The intrinsic innervation of the human gut was studied in strips of circular and longitudinal muscle removed form various regions of the alimentary canal at operation. The strips, all free of the effects of drugs used at surgery, were electrically stimulated (0.1-12 Hz) with square-wave pulses of alternating polarity generated by linked stimulators. Specimens of lower esophageal smooth muscle were obtained from eight patients; 14 circularly cut strips varied in response, generally contracting at 0.1-0.5 Hz, while 10 longitudunal muscle strips were predominantly contracted by electrical stimulation, optimally at 4 Hz. In 52 specimens of gastric body and antrum, electrical stimulation usually elicited contractions which increased as the frequency was raised. Specimens of terminal ileum proximal to the ileocaecal spincter (15 patients) showed circular muscle contracted at 0.1-0.5 Hz, and longitudinal contractile responses at 1-64 Hz. The responses of nine specimens of ascending colon were similar to those reported for the sigmoid colon. Variations, most pronounced at 4 Hz, illustrated a clear gradient of response from the stomach to colon in the longitudinal muscle, with excitation dominant proximally and inhibition dominant distally. The neuronal nature of the response to electrical stimulation was tested with tetrodoxin plus a variety of other drugs, including hexamethonium bromide, KCl, $BaCl_2$, acetylcholine perchlorate, atropine, and hyoscine. The esophageal responses showed that both layers receive excitatory and inhibitory innervation, with cholinergic excitation generally predominating in the distal longitudinal layer. In the stomach, cholinergic contractions converted to nonadrenergic relaxations in the presence of hyoscine. The unresponsiveness of the gastric body circular muscle was attributed to its insulated anatomy. Types of responses in the ileum suggested both adrenergic and nonadrenergic inhibitory nerves, dependent on the type of stimulation. Although gut motility may also be affected by locally released substances or circulating hormones, it is suggested that electrical slow wave activity and the intrinsic innervation are fundamental for the control of normal gut activity. Both revealed gradients down the gut relating to regional differences in function.

6676 THE VAGUS, THE DUODENAL BRAKE, AND GASTRIC EMPTYING.

(E.) Shahidullah, M.; Kennedy, T. L.; Parks, T. G. (Dep. Surg., Queen's Univ., Belfast, Northern Ireland). *Gut* 16(5):331-336, 1975.

The site of duodenal receptors regulating gastric emptying rates was investigated, and the role of the vagus in the regulation of gastric emptying with an intact pylorus was also studied. Gastric emptying studies were carried out before and after vagotomy on two groups of dogs with gastric and duodenal fistulas produced by inserting Gregory cannulas into the stomach and duodenum, resp. The gastroduodenal junction was left intact in the first group, but in the second the pylorus was implanted end-to-side 50 cm further down the small intestine. Five dogs in the first group underwent truncal vagotomy and two dogs in the second group underwent extragastric selective vagotomy. In emptying studies performed 6 to 10 weeks after preparation of fistulas, 600 ml of fluids were used in seven dogs with an intact gastroduodenal junction. The rate of emptying of different instillates varied greatly, with mean emptying times of: deionized water, 44 min; hydrochloric acid, 85 min; dextrose, 126 min; and fat, 144 min. After truncal vagotomy the emptying time for each instillate became significantly longer, but the proportional differences were maintained. In eight dogs with the pylorus implanted into the small intestine, emptying studies utilized 500 ml of different substances introduced into the stomach with 100 ml of deionized water through the duodenal cannula. With water in the duodenum, different instillates emptied from the stomach at similar rates. In four of these dogs, 500 ml of water was instilled into the stomach and 100 ml of different instillates were introduced into the duodenum, resulting in the following mean emptying times: water, 54 min; 250 mM HCl, 80 min; 10% dextrose, 137 min; and 5% fat, 160 min. In two dogs after extragastric selective vagotomy, the rate of emptying of water, dextrose, and fat were similar. These studies indicate that most, if not all, the duodenal braking receptors lie in the proximal 50 cm of the small intestine. It is concluded that vagal innervation of the stomach in dogs is important in gastric emptying, but duodenal innervation is not essential for the function of the braking receptors which appear to work through a hormonal mechanism.

6677 CONTROL OF THE INTERDIGESTIVE MYOELECTRIC ACTIVITY IN DOGS BY THE VAGUS NERVES AND PENTAGASTRIN.

(E.) Marik, F.; Code, C. F. (Mayo Clinic, Rochester, Minn.). *Gastroenterology* 69(2): 387-395, 1975.

The effects of vagotomy and pentagastrin on the interdigestive complex were studied in eight healthy, conscious, fasted female mongrel dogs. The electrical activity of the stomach and small intestine were recorded using surgically implanted monopolar electrodes, and the normal characteristics of the interdigestive myoelectric complex were determined in each dog. The electrical activity of the complex was then recorded during the i.v. infusion of pentagastrin (0.1 μg/kg/min for 10-150 min beginning at various phases during the cycle of the complex), after vagotomy, and during pentagastrin infusion after vagotomy. In intact dogs, pentagastrin infusion interrupted that interdigestive myoelectric complex in the stomach and small intestine and replaced it with activity which closely resembled that seen after feeding. After bilateral transthoracic vagotomy, pentagastrin still interrupted the complex. However, a premature activity front (phase III) of the complex was initiated in the stomach and duodenum after the cessation of pentagastrin infusion; this activity migrated in a normal fashion distally along the small bowel. Vagotomy was also followed by a reduction in the temporal regularity of the cycles of the complex. Fewer cycles/10 hr occurred in most dogs after vagotomy than before surgery, and the complexes were not as regularly interrupted by feeding a small meal (50 g meat) as they had been before vagotomy. The results indicate that both neural and hormonal influences have a role in controlling the interdigestive motor complex in dogs.

6678 INFLUENCES ON COLONIC AND SMALL INTESTINAL MOTILITY BY THE CEREBELLAR FASTIGIAL NUCLEUS.

(E.) Martner, J. (Dept. Physiology, Univ. Goteborg, Sweden). *Acta Physiol. Scand.* 94(1):82-94, 1975.

The fastigial influence on intestinal motility was investigated in acute experiments on chloralosed cats of both sexes. In most animals, the adrenals were ligated and i.v. hydrocortisone (10 mg/kg) was given. Arterial pressure was recorded through a femoral catheter and intestinal motility was recorded in isolated small intestinal and colonic segments, those portions of the small intestine not being used for recording being extirpated, along with the spleen and greater omentum. The vagal and pelvic nerves were dissected and placed on ligatures. Intestinointestinal inhibitory reflexes were elicited by graded distention of a small isolated intestinal loop or by afferent stimulation of thin mesenteric pedicles. For baroreceptor stimulation, one carotid sinus region was isolated and perfused with femoral artery blood and topical cerebellar stimulations were induced by the Horsley-Clarke technique. After each experiment, the cerebellum and adjacent brainstem structures were examined histologically. Electrical stimulation of the rostral fastigial pole produced a rise in blood pressure, increased motor activity in the ileum and colon, and increased and decreased motility responses in the jejunum. The intestinal responses were neither secondary to changes in intestinal blood flow nor to baroreceptor reflexes induced by the increased blood pressure. The excitatory responses were not due to increased parasympathetic activity since sectioning of such pathways failed to abolish the responses. Interruption of adrenergic sympathetic discharge did, however, eliminate these responses, indicating that the fastigial effects were mediated by the suppression of the prevailing adrenergic tone. Noxious stimuli to the abdomen, including laparotomy, inhibited intestinal motility by a reflex increase in adrenergic discharge. It is suggested that the fastigial influence on intestinal motility is due primarily to suppression of this reflex.

6679 INFLUENCES ON THE DEFECATION AND MICTURITION REFLEXES BY THE CEREBELLAR FASTIGIAL NUCLEUS. *(E.)* Martner, J. (Dept. Physiology, Univ. Goteborg, Sweden). *Acta Physiol. Scand.* 94(1):95-104, 1975.

The influence of the cerebellar fastigial nucleus on the defecation and micturition reflexes was studied in chloralosed cats. The Horsely-Clarke technique was used for cerebellar stimulation and the defecation reflex was elicited by afferent stimulation of one cut pelvic nerve or by application of mechanical friction to the rectal mucosa. The small intestine, spleen, and greater omentum were extirpated and in most animals the adrenals were ligated, adrenocortical substitution being given by i.v. hydrocortisone. Catheters were used to record arterial pressure and bladder and colonic motilities were recorded from an isolated perfused proximal colonic loop. Gallamine iodide, guanethidine, bidenzyline, phentolamine, propranolol, and/or atropine were given i.v. in some experiments. Whenever effective, topical fastigial stimulation regularly suppressed both the somatomotor and autonomic components of the defecation reflex; the straining movements and the colonic vasodilatator and motor responses associated with defecation were completely inhibited. Bladder motility could be either suppressed or enhanced, depending on the prevailing bladder tone and on the fastigial site stimulated. The autonomically conveyed inhibitory responses were in both cases independent of the adrenergic sympathetic pathways, since both were unaffected by sympathetic nerve sectioning and by adrenergic blocking drugs, but were eliminated by pelvic nerve section. It is suggested that these fastigial inhibitory influences are exerted on the spinal parasympathetic reflexes controlling both bladder and colon. The rostral ventromedial fastigial pole appears to be involved in sympathetic and parasympathetic autonomic mechanisms, affecting both bladder responses and the defecation reflex.

6680 THE MUCOSAL LINING OF THE INTRAMURAL COMMON BILE DUCT AS A DETERMINANT OF DUCTAL OPENING PRESSURE. *(E.)* Tansy, M. F.; Salkin, L.; Innes, D. L.; Martin, J. S.; Kendall, F. M.; Litwack, D. (Temple Univ. Health Sciences Center, 3223 North Broad St., Philadelphia, Pa. 19140). *Dig. Dis.* 20(7):613-625, 1975.

Histological evidence was sought for the presence of ductal mucosal folds in the intramural portion of the common bile duct of the pigeon, rabbit, cat, dog and human. Common bile duct samples from all species were specifically stained with hematoxylin and eosin and examined microscopically. In other experiments, norepinephrine, histamine, and bethanechol were administered intraductally or i.v. to cats and dogs and the effects on the systemic arterial blood pressure and opening pressures of the choledochoduodenal junction were studied. Structural studies in dogs were also undertaken to compare the luminal topographies of the intramural and extramural portions of the common bile duct. The lumen of the intraduodenal portion of the common bile duct was almost completely filled by folds of a highly vascularized mucosa in all five species studied. These folds were most apparent near the intraduodenal ductal orifice, where they almost completely occluded the lumen. Histological studies in dogs indicated that the mucosal topographies of the extramural and intramural portions of the duct were markedly different. The physiological data in dogs and cats indicate that changes in the systemic arterial blood pressure were associated with changes in the opening pressures of the choledochoduodenal junction; these changes varied in the same direction. The bile duct opening pressures in these two species were increased by the intraductal administration of histamine and were reduced by intraductal norepinephrine. When given i.v., the effects of these drugs were the opposite of those produced by intraductal treatment; however, the secondary effects after i.v. treatment were the same as the effects after intraductal treatment. Histological examination of the intraductal folds subsequent to intraductal histamine revealed a marked vascular engorgement. It is concluded that the most significant determinant of changes in the ductal opening pressures in the cat and dog is probably the state of the mucosal vasculature within the terminal portion of the common bile duct.

6681 INTRALUMINAL AND INTRAPERITONEAL PRESSURES AT THE CARDIA: EFFECT OF HORMONES AND SURGICAL INTERVENTION. *(E.)* Moossa, A. R.; Cooley, G. R.; Skinner, D. B. (Univ. Chicago Hosp. Clinics, Ill.). *Surg. Forum* 24:370-372, 1974.

The effects of hormonal administration, fundic excision, and esophagogastrectomy on the intraluminal and extraluminal pressures in the cardia were studied in Rhesus monkeys. Six refluxing and six nonrefluxing monkeys were given pentagastrin, secretin, and cholecystokinin (CCK-PZ) at varying rates by i.v. infusion or s.c. injection; the intraluminal and extraluminal pressures were monitored by surgically placed catheters. The refluxers were those whose esophageal pH at 3 cm above the intraluminal high-pressure zone at the cardia fell to below 4 at any time during a 5-day study. Fundic excision was performed on two nonrefluxers and esophagogastrectomy was performed on three more nonrefluxers; the effects of the gastrointestinal hormones were also assessed in the latter animals. The extraluminal pressures at the cardia correlated much better with gastroesophageal reflux than did the intraluminal pressures. The gastrointestinal hormones had a variable effect on the intraluminal pressures but did not influence the extraluminal pressures or reflux. It is concluded that external factors other than the angle of His are more important in preventing reflux than any true sphincter under hormonal control.

6682 THE EFFECTS OF PREMEDICATION DRUGS ON THE LOWER OESOPHAGEAL HIGH PRESSURE ZONE AND REFLUX STATUS OF RHESUS MONKEYS AND MAN. *(E.)* Hall, A. W.; Moossa, A. R.; Clark, J.; Cooley, G. R.; Skinner, D. B. (Pritzker Sch. Med., Univ. Chicago, Ill.). *Gut* 16(5):347-352, 1975.

The effects of morphine sulfate (7-10 mg for humans; 1 mg for monkeys), pethidine hydrochloride (40-50 mg, humans; 5-7 mg, monkeys), and diazepam (2.5-10 mg, humans; 0.5-1 mg, monkeys) on the high pressure zone and the reflux status of Rhesus monkeys and man were studied. Esophageal motility was studied by standard manometry in 35 fasting human volunteers and in eight fasting monkeys. The high pressure zone in man was measured as the difference between the end expiratory intragastric pressure and the mean peak pressure in the lower esophagus. In monkeys, the mean intragastric value was subtracted from the mean of the peak lower esophageal pressure. Gastrointestinal reflux was measured using a Beckman intestinal pH electrode which was passed *via* the nostril until it lay in the lower esophagus. The high pressure zone pressure decreased significantly in man after morphine (42.3%) and pethidine (51.61%), and almost significantly after diazepam (35.42%). The reductions in high pressure zone pressures were significant in monkeys after all three drugs (46.3, 52.4, and 59.2% for morphine, pethidine, and diazepam, resp.). Significant reflux, as measured by a score greater than 2 of 20 (reflux in all positions tested), was seen in 14 humans, and injection of drugs increased the numerical reflux score by a mean of 6.35. Drug injection caused reflux (mean, 9.7) in 13 (59%) of 22 subjects who did not reflux on control testing. In monkeys, the relation between the high pressure zone and reflux status depended on the numerical value of the high pressure zone pressure. It is concluded that great caution must be exercised in the administration of these drugs in doses sufficient to cause drowsiness in subjects who will not be under constant skilled supervision, due to the increased risk of regurgitation and pulmonary aspiration.

6683 EFFECT OF NICOTINE ON THE LOWER ESOPHAGEAL SPHINCTER. STUDIES ON THE MECHANISM OF ACTION. *(E.)* Rattan, S.; Goyal, R. K. (Univ. Texas Health Science Center, Dallas, Tex.). *Gastroenterology* 69(1):154-159, 1975.

The effect of nicotine on the lower esophageal sphincter (LES) pressure in anesthetized opossums and the site of its action were studied. Opossums (*Didelphis virginiana*) were anesthetized, and intraluminal pressures were measured with a water-filled and continuously-perfused catheter system. Drugs were administered i.v.: nicotine sulfate (5-4000 μg/kg), atropine sulfate (30 μg/kg), propanolol (1 mg/kg), reserpine (3 mg/kg, twice) and hexamethonium. Nicotine sulfate caused a dose-dependent reduction in LES pressure. The threshold dose was less than 5 g/kg. The dose of 50 g/kg produced the maximal reduction in pressure (85%). Bilateral cervical vagotomy did not alter the effects of nicotine, nor did the adrenergic antagonist propanolol, or reserpine. Neither atropine nor hexamethonium (20 mg/kg) altered the effects of nicotine. LES response to 50 g/kg of nicotine during slow i.v. administration of 4 mg/kg of nicotine was markedly attenuated, indicating tachyphylaxis. The LES pressure during nicotine tachyphylaxis was 28.1 mm of Hg, and was reduced to only 23.9 mm of Hg with 50 g/kg of nicotine. The initial LES pressure fell 86.9% in five animals with a small dose of 0.2 g/kg of nicotine in the branch of the left gastric artery supplying the lower esophageal sphincter. There was a significant difference observed after electrical stimulation of the peripheral end of the vagus after bilateral cervical vagotomy between control (83.3%) and tachyphylaxis (31.8%). These data indicate a dose-dependent reduction in LES pressure following nicotine administration.

6684 FORCE VELOCITY CHARACTERISTICS OF OESOPHAGEAL MUSCLE: INTERACTION OF ISOPROTERENOL AND CALCIUM. *(E.)* Cohen, S. (Univ. Pennsylvania Hosp., 3400 Spruce St., Philadelphia, Pa. 19104). *Eur. J. Clin. Invest.* 5(3):259-265, 1975.

The interaction of isoproterenol and calcium on the force velocity characteristics of esophageal smooth muscle were evaluated. Smooth muscle strips were obtained from 20 adult opossums, and mounted to record tension generated by the circular layer. To obtain the force-velocity relation, the neurogenic response elicited at the termination of electrical stimulation was utilized. Force-velocity curves were constructed during superfusion of Kreb's solution containing 5.0 mM Ca^{++} as well as the usual 2.5 mM Ca^{++}. After determination at the different calcium concentrations, isoproterenol (10^{-7}, 10^{-6}, 10^{-5}, and 10^{-4} M) was added to the superfusate. All muscle was studied at its length of optimal tension development (Lo). The maximal velocity of shortening (V_{max}) and the peak force (Po) of esophageal muscle were 6.2 mm/sec and 16.8 g, resp., at 2.5 mM calcium. Isoproterenol (10^{-5} M) decreased the V_{max} to 4.9 mm/sec and the Po to 9.8 g ($P < 0.01$). Increased calcium (5.0 mM) alone did not alter either V_{max} or Po. At 5.0 mM calcium, 10^{-5} isoproterenol reduced the V_{max} to 6.0 mm/sec and the Po to 13.9 g. These studies indicate that isoproterenol significantly reduces the V_{max} and Po of esophageal smooth muscle during the neural mediated 'off response.' This effect of isoproterenol is reversed in part by an increase in calcium concentration.

6685 EFFECTS OF TEMPERATURE AND INORGANIC IONS ON CALCIUM ACCUMULATION IN MICROSOMES FROM INTESTINAL SMOOTH MUSCLE. *(Eng.)* Hurwitz, L.; Debbas, G.; Little, S. (Univ. New Mexico Sch. Medicine, Albuquerque, N. M.). *Mol. Cell. Biochem.* 8(1): 31-42, 1975.

The effects of alterations in temperature and in the inorganic ion composition of the bathing medium on the mechanical activity in intact muscle fibers and ATP-dependent calcium accumulation in microsomal vesicles were studied using the isolated longitudinal smooth muscle from guinea pig small intestine. The temperature was maintained at 10 or 30° C and the bathing medium contained $CdCl_2$, $BaCl_2$ and/or $MnCl_2$. Isotonic contractions of the longitudinal muscle were recorded following the addition of acetylcholine bromide (1.4×10^{-6} M) to the medium, and a microsomal fraction of muscle was assayed for calcium uptake and release and examined by electron microscopy. A reduction in temperature from 30 to 10 C inhibited the microsomal uptake and release of calcium. The change in temperature also slowed the rate of relaxation of the intact muscle after acetylcholine-induced contraction. The presence of $CdCl_2$ in the medium also decreased the uptake of calcium into the microsomal vesicles, but the release of calcium from the microsomes was accelerated. $BaCl_2$ had similar but less marked effects on calcium uptake and very little effect on calcium release. $MnCl_2$ had no significant effects on either uptake or release. Whereas both $CdCl_2$ and $MnCl_2$ exerted an inhibitory influence on the acetylcholine-induced contractile responses of the intact muscle fibers, $BaCl_2$ served to initiate a contractile response. Thus, the effects of temperature on microsomal calcium binding can be correlated with the effects on mechanical activity in the intact fibers, but the effects of $CdCl_2$, $BaCl_2$, and $MnCl_2$ on these two cellular processes do not show any consistent pattern.

6686 SUBSTITUTION OF Ca^{++} WITH Ba^{++} AND Mn^{++} ON THE TONIC AND PHASIC CONTRACTIONS OF THE SMOOTH MUSCLE OF THE STOMACH. *(E.)* Boev, K.; Papazova, M.; Milousheva, E. (Bulgarian Acad. Sci.). *C. R. Acad. Bulg. Sci.* 28(4):553-556, 1975.

The effects of replacing Ca^{++} in the bathing solution with Ba^{++} or Mn^{++} on the tonic and phasic contractions of the feline gastric smooth muscle was studied *in vitro*. Isolated strips of stomach were bathed in Krebs solution; in some experiments, sucrose (137 mN), $BaCl_2$ or $MnCl_2$ (10^{-4} M), acetylocholine (10^{-8}, 10^{-7}, or 10^{-6} M), D_{609} (10^{-5} M), nitroprusside sodium (10^{-5} or 10^{-6} M), and/or EDTA (5.10^{-4} M) were added to the solution. The sucrose gap method was used to study the electric and contractile activities of the muscle preparations. The phasic contractions of the antral muscle strips were completely inhibited by EDTA treatment and the removal of Ca^{++} from the nutrient medium; the spontaneous myogenic tonus of the fundic strips was also abolished under these conditions. The addition of $BaCl_2$ to the Ca^{++}-deprived or EDTA-treated media led to a gradual restoration of the phasic activities in these strips. D_{609}, but not sodium nitroprusside, completely blocked the Ba^{++}-induced phasic contractions. The contractile activity in the strips bathed in medium containing EDTA but no Ca^{++} disappeared prior to the appearance of characteristic changes in the bioelectric activity of the preparation. Acetylcholine activated the contractile activity of the preparations in the presence of $BaCl_2$, but had no such effect on medium containing neither Ca^{++} nor Ba^{++}. In small doses, Mn^{++} inhibited the tonic contractions of the fundic strips but had no influence on the phasic contractions of the antral strips. When added to a Ca^{++}-free medium containing EDTA, Mn^{++} caused a gradual increase in the tonic contractions of the fundic and body strips; this effect was observed in the presence of D_{600} but was blocked by sodium nitroprusside. The data indicate that the mechanisms of action of Ba^{++} and Mn^{++} on the smooth muscle cells of the stomach differ. They also emphasize the specificity which is characteristic of the different smooth muscles of the stomach.

6687 MODIFICATION BY EXTERNAL CALCIUM AND MAGNESIUM IONS OF THE POTENTIATIVE ACTION OF 5'-AMP ON THE ATP-INDUCED CONTRACTION OF ISOLATED GUINEA-PIG ILEUM. *(E.)* Iso, T. (Res. Lab., Santen Pharmaceutical Co., Ltd., Higashiyodogawa-ku, Osaka, Japan). *Jpn. J. Pharmacol.* 24(5):797-801, 1974.

Studies were undertaken to determine the effects of Ca^{++} and Mg^{++} concentrations in Tyrode solution on the contractile responses of isolated guinea-pig ileum to adenine nucleotides and acetycholine. ATP and ADP, but not AMP, produced contractions in the isolated ileum, with the contractile activity of ADP about three times as potent as that of ATP. Lowering the Mg^{++} concentration below 1.0 mM (normal) enhanced the contractile responses to ATP and acetycholine, but lowering the Ca^{++} concentration from 1.8 to 0.1 mM depressed the responses. This inhibitory effect of low Ca^{++} on the contractile responses to low ATP concentrations (3×10^{-6} to 3×10^{-5} M) was not observed in the absence of Mg^{++}; in contrast, the response to acetycholine was depressed by 0.1 mM Ca^{++} in Mg^{++}-free medium. In normal Tyrode solution, the response to ATP was significantly potentiated by 5'-AMP (1 mM) but depressed by adenosine (1 mM). The contractile response to acetylcholine was slightly depressed by both 5'-AMP and adenosine. The potentiative action of 5'-AMP on the ATP-induced contraction in normal Tyrode solution disappeared at 0.1 mM Ca^{++} in Mg^{++}-free medium. The inhibitory effects of 5'-AMP and adenosine on the acetylcholine-induced contraction were augmented by 0.1 mM Ca^{++}, as was the inhibitory effect of adenosine on the ATP-induced contraction. It is suggested that the depolarized state after low Ca^{++} may play an important role in augmenting the inhibitory effect of 5'-AMP, although the mechanism of actions remains to be elucidated.

6688 THE EFFECT OF CHOLECYSTOKININ ON ELECTRICAL SPIKE POTENTIALS AND INTRALUMINAL PRESSURE VARIATIONS IN THE HUMAN SMALL INTESTINE. *(E.)* Oigaard, A.; Dorph, S.; Christensen, K. C.; Christiansen, L. (Rigshospitalet, Blegdamsvej 9, Copenhagen, DK-2100, Denmark). *Scand. J. Gastroenterol.* 10(3): 257-262, 1975.

The effect of cholecystokinin (CCK) on duodenal motility was studied in six patients with inguinal hernia and in nine patients with cholecystolithiasis. The effect of CCK on ileal motility was studied in six patients who had been treated with ileostomy for ulcerative colitis; of the cholecystolithiasis patients, five were studied before and after cholecystectomy, two were studied only preoperatively, and two were studied only postoperatively. Probes were passed into the distal part of the descending duodenum or about 10 cm into the ileum through the ileostomy. Recordings of the electrical spike potentials and intraluminal pressure were made before and after i.v. CCK (80 dog Ivy U, given over a 2-min period). In the duodenum, quantitative calculations of motility gave identical values before and after drug administration, and the results were identical in the cholecystolithiasis patients before and after surgery and in the hernia patients. A decrease in the amplitude of the spike potentials was observed in the duodenum during the first few min after drug administration in all groups. Recordings in the distal ileum showed a significant increase in motility after CCK, with no change in the spike potential amplitude. The data suggest that CCK has no effect on duodenal activity but that it does in some way modify the electrical activity of the smooth muscle cell.

6689 ELECTRICAL SPIKING ACTIVITY AND PROPULSION IN SMALL INTESTINE IN FED AND FASTED RATS.

(E.) Ruckebusch, M.; Fioramonti, J. (Dept. Physiology, Natl. Veterinary Sch., 31076 Toulouse, France). *Gastroenterology* 68(6):1500-1508, 1975.

The role of food consumption on the pattern of the electrical spiking activities of the small intestine and on the time course of small intestinal propulsion were examined in male Wistar rats. From two to eight pairs of electrodes 2 mm apart were positioned at intervals of 10 cm; the first site was 10 cm from the pylorus. An indwelling polyethylene tube was placed in the duodenum or jejunum beneath an electrode site, and in the ileum, in 40 rats. Of these, 10 also had a gastric cannula. All rats were fed and received water *ad libitum* four days/week, and were fasted for 3 days/week. In both the fed and fasted rats, slow waves occurred at a high frequency in the duodenum (36-40/min) compared to the ileum (30/min). Almost continuous irregular spiking was recorded in fed rats, characterized by randomly occurring short spike bursts. The electrical spiking in fasted rats 6 hr after food withdrawal became regularly interspersed at 15-min intervals with periods of quiescence. The spiking activity showed two phases: 1) spike bursts on only 30% of the slow waves; and 2) all slow waves contained spike bursts of maximal duration. The corresponding integrated record for 24-hr fasted rats showed that the duration of the two phases occupied about 2/3 of the total recording time, and the migrating myoelectric complex as a whole occurred three to four times/hr. Intragastric administration of food and amino acids (NaCl, 3.6%, 10 ml; glucose, 8%, 5 ml; amino acids, 450 mM/l, 5 ml) caused continuous irregular spiking for 2 to 3 hr. A similar effect was caused by the food components administered into the duodenum. Oleic acid (0.1 ml) in either the stomach or duodenum caused continuous, but weak, irregular spiking. The velocity of intestinal transit was faster in fasted rats when phenol red (bolus) was administered before a migrating complex than after. The percentage of total bolus emptied by the stomach and each successive segment of the small intestine was approximately 30% and 65% in fed and fasted rats, resp. These data indicate that the presence of nutrients in the stomach and duodenum is capable of inducing a pattern of continuous irregular spiking activity.

6690 POTENTIATION BY COCAINE OF RELAXATIONS OF THE GUINEA-PIG COLON CAUSED BY NORADRENALINE AND BY STIMULATION OF ADRENERGIC NERVES.

(Eng.) Costa, M.; Furness, J. B.; Dawson, K. (Dept. Zoology, Univ. Melbourne, Parkville, Victoria 3052, Australia). *Ajebak* 53(3):223-232, 1975.

The effects of cocaine on the noradrenaline-, isoprenaline-, and inhibitory nerve stimulation-induced relaxations in isolated segments of the guinea-pig distal colon were studied. Cocaine caused a threefold sensitization of the muscle to noradrenaline but no sensitization to isoprenaline. Cocaine (10^{-6} g/ml) also increased the duration, but not the amplitude, of the muscle relaxation observed when branches of the colonic nerves, which carry adrenergic fibers to the colon, were stimulated at frequencies of 1 to 32 Hz in the presence of hyoscine ($6 \cdot 10^{-7}$ g/ml). In the presence of guanethidine, the response was not significantly prolonged by cocaine, but its amplitude was reduced slightly. Cocaine did not affect either the amplitudes or the durations of the responses to intrinsic nerve stimulation in the presence of hyoscine or guanethidine; the relaxation of the colon under intrinsic nerve stimulation has been shown to be due to the activation of nonadrenergic nerves. Fluorescence histochemical studies indicated that the adrenergic nerve terminals lie in Auerbach's plexus, not in the longitudinal muscle. It is concluded that the cocaine-induced sensitization to noradrenaline and the increases in the duration of response to adrenergic nerve stimulation are due to an inhibition of catecholamine uptake into the adrenergic nerves. It appears that even when the neuromuscular separation is large, as in the colon, the concentration of exogenous noradrenaline at the receptors can be decreased by neuronal uptake, and that the uptake mechanism can modify the responses in nerve stimulation *in vitro*.

6691 THE EFFECT OF GLUCOSE AND TETRAETHYLAMMONIUM ON THE PROPULSIVE MOTILITY OF SMALL INTESTINE IN HYPOPHYSECTOMIZED RATS.

(E.) Peng, Y. I.; Peng, M. T. (Coll. Medicine, Natl. Taiwan Univ., Taipei). *J. Formosan Med. Assoc.* 73(8):445-450, 1974.

Blood sugar levels and the propulsive motility of the small intestine were measured simultaneously in tetraethylammonium chloride (TEA)-treated, insulin-hypoglycemic, and hypophysectomized rats to determine the mechanism of increased small intestinal motility after hypophysectomy. Male Long-Evans rats were divided into groups receiving i.p.: 1) saline (1 ml/kg, control); 2) TEA (20 mg/kg); 3) insulin (2 U/kg); 4) insulin and TEA; 5) hypophysectomy with saline; 6) hypophysectomy with TEA; and 7) hypophysectomy with glucose (5%, 20 ml/kg, s.c.). Propulsive motility was determined by tracing the distance traversed by 10% charcoal (1 ml in 10% acasia by stomach tube). After insulin injection the blood sugar levels of the intact rats decreased to the levels of hypophysectomized rats and the motility of insulin-hypoglycemic rats increased to the level of the hypophysectomized rats. After glucose administration the blood sugar level of the hypophysectomized rats rose above normal levels and motility decreased to a value not significantly different from intact animals. Propulsive motility was significantly more rapid in hypophysectomized rats and insulin-hypoglycemic rats than in intact animals. TEA caused a significant decrease in motility in intact, hypophysectomized, and insulin-hypoglycemic rats compared with rats not receiving TEA. However, the motility of TEA-treated hypophysectomized and insulin-hypoglycemic rats was still significantly faster than that of TEA-treated intact rats. These results suggest that the low blood sugar levels of hypophysectomized rats induce increased small intestinal motility.

6692 ANALYSIS OF THE MOTOR EFFECTS OF 13-NORLEUCINE MOTILIN ON THE RABBIT, GUINEA PIG, RAT, AND HUMAN ALIMENTARY TRACT IN VITRO. *(E.)* Strunz, U.; Domschke, W.; Mitznegg, P.; Domschke, S.; Schubert, E.; Wunsch, E.; Jaeger, E.; Demling, L. (Dept. Medicine, Univ. Erlangen-Nuremberg, Krankenhausstrasse 12, D-852, Erlangen, West Germany). *Gastroenterology* 68(6):1485-1491, 1975.

Motor effects of 13-norleucine motilin (13-Nle-M), a synthetic polypeptide analog of motilin, on the contractility of the alimentary tract of rabbit, guinea pig, Wistar rat, and man were investigated *in vitro*. The effects of the drug were limited to specific regions of the gastrointestinal tract. Guinea pig and rat preparations were refractory to 13-Nle-M action. Stomach and upper small intestine muscle strips from the rabbit and man were highly sensitive to the drug; contractile responses were elicited with concentrations of $< 2 \times 10^{-9}$. Although circular muscle from rabbit colon responded to 13-Nle-M, *Taenia coli* preparations were unaffected by the polypeptide; in man the reverse occurred. Gallbladder, uterine, and vascular smooth muscle were unresponsive to 13-Nle-M. Pharmacological analysis revaled that 13-Nle-M acts directly on gastrointestinal smooth muscle and its effects are not mediated *via* nervous pathways. Ganglion blockade by hexamethonium iodide, blockade of axonal conduction by tetrodotoxin, or anticholinergic action by atropine failed to affect the polypeptide actions. It was concluded that 13-Nle-M caused contractions by stimulating receptors on or in muscle cells. Histamine receptors were differentiated from the site of action of 13-Nle-M by the use of the antihistamine pheniramine. The Ca^{++} antagonist compound, verapamil, abolished the contractile response to 13-Nle-M. Thus, 13-Nle-M may be involved in the transport of Ca^{++} to the cytosol of intestinal smooth muscle and cause the initiation of contraction.

6693 ANTIPHOSPHODIESTERASE ACTIVITY AND NONSPECIFIC SMOOTH MUSCLE RELAXATION TESTED ON INTESTINAL SMOOTH MUSCLES. *(E.)* Inatomi, N.; Takayanagi, I.; Takagi, K. (Faculty Pharmaceutical Sciences, Univ. Tokyo, Bunkyo-Ku, Tokyo 113, Japan). *Jpn. J. Pharmacol.* 25(1):63-69, 1975.

The modes of action of papaverine and some nonspecific smooth muscle relaxants on phosphodiesterase were studied. Studies were also carried out to determine whether intestinal smooth muscle relaxation produced by the papaverine-like drugs is mediated by an increase in the intracellular cyclic AMP, which is caused by inhibition of phosphodiesterase. The circular muscle from dog small intestine and the guinea pig taenia coli were used. Extrapolation of double Lineweaver-Burk plots yielded two apparent Michaelis constants (6.7×10^{-6} M and 9.1×10^{-5} M) for cAMP hydrolysis. Similar results were obtained in all enzyme preparations from guinea pig taenia coli and dog small intestine. Papaverine inhibited low K_m enzyme completely. The synthetic antispasmodic drug 1,1-diphenyl-3-piperidinobutanol hydrochloride had little inhibitory action on either enzyme. Caffeine, sodium benzoate, and hydralazine in a 1000 x *g* supernatant of guinea pig taenia homogenate inhibited the low and high K_m enzymes noncompetitively. Papaverine and aminophylline inhibited the low K_m enzyme noncompetitively and the high K_m competitively. The antiphosphodiesterase activities, as negative logarithms of K_i values, of the median effective dose of papaverine almost equaled negative logarithm of its K_i value. There was little correlation between the smooth muscle relaxing activities and the antiphosphodiesterase activities. It is concluded that there are at least two mechanisms for the nonspecific smooth muscle relaxants, one due to the increase of intracellular AMP caused by inhibition of phosphodiesterase, and the other not involved with the intracellular cAMP level.

6694 EFFECT OF PROSTAGLANDIN E_1 ON REACTIVITY OF RAT COLON, INCLUDING THE ROLE OF THE ADRENERGIC SYSTEM. *(Eng.)* Szalaj, W.; Gabryelewicz, A.; Stasiewicz, J. (Inst. Internal Medicine, Bialystok, Poland). *Mater. Med. Pol.* 7(2):99-101, 1975.

The effects of prostaglandin E_1 (PGE_1) on contractile activity and the functional state of adrenergic receptors of the proximal part of the colon in 26 male Wistar rats were studied by drug-induced stimulation and inhibition. PGE_1 administration (1, 10 and 100 µg/ml) caused colon contraction; the magnitude of contraction was dose-dependent. Administration of isoproterenol, a β-adrenergic agonist, 30 sec before PGE_1, produced a decrease in the contractile response (18%). Blocking β-adrenergic receptors with propranol augmented PGE_1-induced contraction (20%). Stimulation and inhibition of α-adrenergic receptors with L-phenylephrine hydrochloride and phentolamine, resp., produced insignificant changes in the response to PGE_1 (only a slight decrease in contraction). It is concluded that β-receptors have a stronger inhibiting influence than α-receptors and that the functional state of the adrenergic system, particularly the β-receptors, modifies the contractile response to PGE_1.

6695 EFFECT OF TWO METHYLATED PROSTAGLANDIN E$_2$ ANALOGUES ON GASTRODUODENAL PRESSURE IN MAN.

(E.) Nylander, B.; Andersson, S. (Karolinska Hosp., Stockholm, Sweden). *Gut* 15(11):91-95, 1974.

The effects of two methylated analogues of prostaglandin E$_2$(PGE$_2$), 16,16-dimethyl PGE$_2$ and 15(S)-15-methyl ester, on gastrointestinal motor activity was studied in five healthy men. The intraluminal pressure in the pyloric antrum and in the duodenum was recorded using small rubber balloons tied to a polyethylene tube; they were filled with water, and pressure was continuously recorded on a Rikadenki 3-channel recorder. Two types of experiments were performed. In the first, the subjects fasted overnight, and swallowed the balloon taped onto a Beckman glass electrode, the tip of which was positioned in the descending part of the duodenum *via* fluoroscopy. After a test meal (200 ml of meat bouillon), 80μg of 16,16-dimethyl PGE$_2$ was swallowed, followed by an identical test meal; subsequent pressure recordings revealed no significant changes in the motor response. However, p.o. administration of 140μg of the analogue completely inhibited motor activity in both the stomach and the duodenum. In an additional experiment, pressure recordings were made on two subjects during secretory tests after duodenal administration of 80 or 100μg of 15(S)-15-methyl PGE$_2$ methyl ester. Gastric secretion was continually stimulated by i.v. infusion of pentagastrin, and the gastric juice periodically collected. The balloon, located in mid duodenum, revealed almost complete inhibition of the duodenal motor activity in each instance. The lack of detectable effect of the 80μg dose of 16,16-dimethyl PGE$_2$ was noted, despite previous reports of the dose producing a marked inhibition (70%) of acid secretion. It is suggested that the PGE$_2$ analogue inhibited duodenal, as well as gastric, pressure by a similar direct effect on the smooth muscle, as had been recorded *in vitro*.

6696 EFFECT OF 16,16-DIMETHYL PGE$_2$ ON GASTRIC EMPTYING AND INTESTINAL TRANSIT OF A BARIUM-FOOD TEST MEAL IN MAN.

(E.) Nylander, B.; Mattsson, O. (Karolinska Hosp. S-104 01, Stockholm 60, Sweden). *Scand. J. Gastroenterol.* 10(3):289-292, 1975.

The effect of 140 μg of 16,16-dimethyl prostaglandin E$_2$ (16,16-dimethyl PGE$_2$) on gastric emptying and intestinal transit of a barium-food mixture was studied in eight healthy adult males. Transport of the test meals from stomach to colon was followed by low dose fluoroscopy with repeated photographic recording (every 15 min during the first two hr after ingestion and then every half hr for an additional 1.5 hr). 16,16-Dimethyl PGE$_2$ significantly enhanced the rate of gastric emptying; the mean emptying times with and without this compound were 34 and 74 min, resp. In addition, food-contrast medium appeared sooner in the colon following 16,16-dimethyl PGE$_2$ administration. After administration of 16,16-dimethyl PGE$_2$ in five subjects, the duodenum and the first part of the jejunum appeared flaccid and dilated. It is postulated that the more rapid emptying of the stomach after administration of 16,16-dimethyl PGE$_2$ is due to a decreased duodenal resistance to the gastric outflow. Thus, the earlier appearance of contrast in the colon could be partially due to the more rapid gastric emptying following 16,16-dimethyl PGE$_2$ administration.

6697 INFLUENCE OF SULPIRIDE ON GASTROINTESTINAL MOTILITY. EXPERIMENTAL RADIOLOGICAL STUDY IN THE DOG.

(E.) Boccadero, B.; Leonardi, L.; Calvari, A. R. (Inst. Veterinary Radiology, Univ. Milan, Italy). *Arzneim. Forsch.* 25(6):905-916, 1975.

The effect of N-ethyl-2(2-methoxy-5-sulfamido-benzamido-methyl)-pyrrolidine (sulpiride) on gastrointestinal motility during radiological examinations was studied in nine dogs. The drug was administered in a single dose either immediately after or 10 min before the barium meal. Sulpiride was given: i.v., 0.25 to 10 mg/kg; i.m., 1 to 4 mg/kg; p.o., 2.5 to 25 mg/kg (syrup); or p.o., 5 to 10 mg/kg (capsule). Over a period of 9 mo, 92 complete radiological examinations of the gastrointestinal tract were carried out. Generally sulpiride accelerated transit time and the optimal doses were: i.v., 1 mg/kg; i.m., 2 to 4 mg/kg; and syrup and capsule, 5 to 10 mg/kg. Strong, multiple peristaltic waves from the cardia towards the pylorus, consistent with the expression of gastric hyperkinesia, were seen in the stomach after sulpiride administration. A general increase of tonic activity and phasic activity, mainly of a propulsive type, was seen in the duodenum. Varying effects of the drug were seen in the jejunum and ileum which were independent of dosage or route of administration. These effects included: generalized hypertonia, generalized hypotonia and some periods of dystonia. The reaction in the colon was variable, including normal, segmentary or total hypertonia, or sometimes mild hypotonia. It is suggested that sulpiride be used in radiological examinations due to its effects on normal smooth gastrointestinal musculature.

6698 THE EFFECT OF DUODENAL INFUSION ON THE ELECTROMYOGRAM OF GASTRIC MUSCLE DURING ACTIVATION AND INHIBITION OF GASTRIC EMPTYING.

(E.) Bell, F. R.; Grivel, M. (Royal Veterinary Coll., London, N.W. 1, England). *J. Physiol.* 248(2):377-391, 1975.

The effects of duodenal infusions of HCl and sodium bicarbonate on the activity of the gastric musculature were studied in conscious Friesian bull calves by recording the e.m.g. from antrum and fundus and simultaneously measuring the output of a test meal from the stomach. The test meals consisted of sodium bicarbonate, HCl, or distilled water with phenol red as a marker. E.m.g. recordings were made from the lesser and greater curvature of the fundus, from the antrum and pylorus of the abomasum, and from the duodenum; recordings were made before the onset of duodenal infusion, during duodenal infusion, and during simultaneous duodenal infusion and test meal administration. When the abomasum was partially distended by the water and bicarbonate, but not the HCl test meals, rhythmic motility was readily recorded from the e.m.g. of the smooth muscle of the fundus and antrum; the rhythmic contractions of the antrum during gastric evacuation of the meal were reinforced by both rhythmic and tonic fundic contractions. The output volume of the stomach was directly correlated with the e.m.g. activity. The intragastric fluid was generally emptied in gushes coinciding with a strong contraction of the antrum; however, during periods of antral activity after ingestion of the HCl test meal, the fluid was evacuated *via* the force generated by persisting rhythmic fundic contractions. Using reentrant cannulas so that the duodenum could be infused separately from the gastric effluent, isotonic sodium bicarbonate produced almost 100% gastric evacuation with greatly enhanced e.m.g. activity of the fundus and antrum. Duodenal HCl produced the opposite effect, the gastric muscle becoming quiescent and 100% of the gastric test meal being retained. The data show that the activating or inhibitory effects of a duodenal infusate are produced through an activating or inhibitory effect on the smooth muscle of the stomach. The mechanism of the interrelationship between duodenal receptor and gastric effector is unclear, but the connection is not intramural since it continued when the duodenum was transected near the pylorus.

6699 EFFECT OF HEMORRHAGE ON MYOELECTRIC ACTIVITY OF STOMACH AND DUODENUM IN DOGS. *(E.)*

Kowalewski, K.; Zajac, S. (Surgical-Medical Res. Inst., Univ. Alberta, Edmonton, Alberta, Canada). *Surg. Gynecol. Obstet.* 141(2):227-231, 1975.

Systemic arterial hemorrhage was induced in male mongrel dogs, and the myoelectric activity of the stomach and duodenum during and after loss of blood was recorded. Dogs with previously implanted gastric and duodenal electrodes were used. A marked decrease in arterial blood pressure was observed in all dogs after each bleeding, although the effect was different in each dog. In all dogs, blood pressure fell to 0 mm of Hg after 75% blood loss. The average frequency of electrical control activity/min was 4.8 for the stomach and 18.9 for the duodenum, during the 30-min period preceding bleeding. Progressive loss of blood volume was accompanied by progressive deterioration of electrical recordings. The blood removed after four bleedings (60% total volume) was retransfused in 25 min. There was a simultaneous return of arterial blood pressure and electrical control activity to normal. Irregular bursts of spikes occurred in all stomachs after the third or fourth bleeding, which lasted for no more than 2 min and were associated with antral contractions. Hemorrhage induced major changes in some blood values, such as: pH, after bleeding 7.08 (before, 7.38); hemoglobin, 10.8 g% (11.9 g%); bicarbonate, 13.2 mEq/l (20.6 mEq/l); arterial pO_2, 53.1 mm Hg (82.0 mm Hg); venous pO_2, 26.0 mm Hg (34.0 mm Hg); arterial pCO_2, 24.0 mm Hg (33.4 mm Hg); and venous pCO_2, 55.1 mm Hg (30.6 mm Hg). These results confirm the importance of a time factor in the development of the metabolic effects of hemorrhage.

6700 EXPERIMENTAL ESOPHAGITIS IN CATS IMPAIRS LOWER ESOPHAGEAL SPHINCTER PRESSURE. *(E.)*

Eastwood, G. L.; Castell, D. O.; Higgs, R. H. (United States Naval Hosp., Philadelphia, Pa.). *Gastroenterology* 69(1):146-153, 1975.

The histological appearance of the lower esophagus was compared with lower esophageal sphincter (LES) pressure measurements, before and during the development of experimental esophagitis, as well as after a period of healing. All cats underwent baseline LES pressure measurements and mucosal suction biopsies. After 1 week, on each of 4 consecutive days, LES pressure was determined. A manometry tube was either then withdrawn or advanced 5 cm, and either the esophagus or stomach was perfused with 0.1 N HCl or distilled water, at the rate of 1.1 ml/min. On day 5, LES pressure was recorded and mucosal biopsies were taken. At the end of a 3.5-week recovery period, LES pressure and mucosal biopsies were again obtained. All initial biopsies were normal. Severe esophagitis developed in all five cats receiving 0.1 N HCl for 1 hr/day. Biopsy during the perfusion period in these animals showed an architecturally nondescript mass of inflammatory tissue devoid of surface epithelium. After the healing period, two of these five developed strictures; the surface epithelium had regenerated in the remaining three. After 4 days of esophageal perfusion for 0.5 hr/day, inflammatory changes were produced in all three cats in this group, although these changes were not so severe as those found in the first group. Mucosal edema and neutrophilic infiltration were also evident. All biopsies were normal after recovery. Controls receiving water or HCl in the stomach showed no mucosal abnormalities. There was no difference in mean LES pressure in the four groups before induction of esophagitis. LES pressure began to drop in the first group by perfusion day 2, and mean LES pressures on days 4 and 5 were significantly lower than basal values. A similar but less rapid fall occurred in LES pressures of cats in the second group. These results show that profound reductions in LES pressures are associated with the development of esophageal inflammation in cats, and that LES pressure returns to normal upon resolution of the inflammation.

6701 EFFECT OF ACUTE ISCHEMIA ON THE MOTILITY OF THE SMALL BOWEL IN THE AWAKE DOG. *(E.)*

Guisan, Y. J.; Hreno, A.; Gurd, F. N. (Montreal General Hosp., Montreal, Quebec, Canada). *Eur. Surg. Res.* 7(1):23-33, 1975.

A method was designed to allow the study of the small intestine motility response in intraluminal mucosal stimulation after ischemia in a 30-cm loop of the upper jejunum of mongrel dogs (26-28 kg). The effect of acute ischemia was obtained by clamping the feeding arteries. Studies were performed on the awake dog in order to eliminate anesthetic side-effect. A jejunostomy with a Roux-en-Y anastomosis for reestablishment of intestinal continuity was constructed to gain access to the upper jejunum. The jejunal segment proximal to the anastomosis was brought out through the skin. The motility was estimated after mucosal stimulation with a standard bolus of isotonic 0.1 N HCL (5 ml). Stimulation occurred every eight min and the time lag between stimulation and response, frequency, maximum and mean amplitude, and number of contractions were considered. This technique possessed high reproducibility; a typical response followed 42 of 45 bolus injections. Acute ischemia caused an immediate hyperexcitability of the jejunum section under study, despite a complete destruction of the mucosa, followed by an irregular hyperexcitable pattern during the first 48 hr after injury. The controls presented a strongly diminished response to stimulation with a slow recovery. The hyperexcitable state which results after ischemia may mask more subtle changes in motility regulation which would be a consequence of specific mucosal damage.

6702 EFFECT OF A SEROTONIN ANTAGONIST (PCPA) ON THE DUMPING SYNDROME IN GASTRECTOMIZED DOGS. *(E.)* Bucholz, R. W.; Storer, E. H. (Veterans Admin. Hospital, West Haven, Conn.). *Surg. Forum* 24:414-416, 1973.

A recently discovered specific serotonin antagonist parachlorophenylalanine (PCPA) was used to study the role of serotonin release from the bowel in the gastrointestinal component of the dumping syndrome. Sixty percent gastric resections were performed on 10 dogs, and dumping was induced by instillation of a hypertonic glucose-barium meal through an orgastric tube. Criteria used to determine the presence of dumping included characteristic physical signs of dumping, fluoroscopic determination of bowel hypermotility, and serial roentgenograms. Dumping was easily induced in the gastrectomized dogs. However, s.c. administration of PCPA (75 mg/kg/day) for eight days successfully eliminated any signs of dumping after instillation of a hypertonic glucose-barium meal, and resulted in an average decrease in small-bowel serotonin to 10% of normal levels. Unlike previously studied antagonists, PCPA was a specific, potent inhibitor of serotonin synthesis, acting through inhibition of the rate-limiting enzyme tryptophan hydroxylase. Its role of an effective depletor of bowel serotonin, in the absence of side-effects on the metabolism of other biologic amines, is further evidence for a role of serotonin in the gastrointestinal component of the postgastrectomy dumping syndrome.

6703 THE EFFECT OF THE PYLORIC SPHINCTER ON STOMACH EMPTYING. *(Rus.)* Kharchenko, N. M.; Groisman, S. D. (Res. Inst. Physiol., Univ. Kiev, USSR). *Biull. Eksp. Biol. Med.* 79(2):26-29, 1975.

6704 THE INTERACTION OF K$^+$ AND ANGIOTENSIN IN THE ISOLATED DENERVATED RAT STOMACH. *(It.)* Cessi, C.; Bettini, V. (Inst. Fisiologia Umana, Univ. di Padova, Padua, Italy). *Boll. Soc. Ital. Biol. Sper.* 50(15):1231-1234, 1974.

6705 MOTOR ACTIVITY OF STOMACH AND INTESTINE WITH INJECTION OF SEROTONIN INTO HYPOTHALAMUS. *(Rus.)* Bogach, P. G.; Koval, L. A. (Inst. Physiology, State Univ., Kiev, USSR). *Fiziol. Zh. SSSR* 21(1):37-40, 1975.

6706 CONTRACTILE RESPONSES TO Ca^{++} OF THE ISOLATED DENERVATED RAT STOMACH IN THE PRESENCE OF ANGIOTENSIN. *(It.)* Cessi, C.; Bettini, V. (Inst. Fisiologia Umana, Univ. Padova, Padua, Italy). *Boll. Soc. Ital. Biol. Sper.* 50(15):1225-1230, 1974.

6707 MODE OF ACTION OF BISACODYL (DULCOLAX) ON ISOLATED MUSCLES OF HUMAN COLON. *(Ger.)* Mitznegg, P.; Schubert, E.; Domschke, W.; Strunz, U.; Domschke, S.; Schwemmle, K.; Demling, L.; Heim, F. (Pharmakologisches Institut der Universitat Erlangen-Nurnberg, Erlangen-Nuremberg, Germany). *Klin. Wochenschr.* 53(10):493-495, 1975.

6708 THE IN VIVO EFFECTS OF PROSTAGLANDINS IN RAT JEJUNUM. *(E.)* Declusin, R.; Wall, M.; Whalen, G. (VA Hosp., Milwaukee, Wis.). *Gastroenterology* 68(4):1013, 1975.

6709 SMALL BOWEL MOTILITY DURING INTRAVENOUS HYPERALIMENTATION IN THE DOG. *(E.)* Weisbrodt, N. W.; Copeland, E. M.; Thor, P. J.; Dudrick, S. J. (Univ. Texas Med. Sch., Houston, Tex.). *Gastroenterology* 68(4):1011, 1975.

6710 EFFECT OF JEJUNAL PERFUSION OF AMINO ACIDS ON GALLBLADDER CONTRACTION IN DOGS. *(E.)* Gadacz, T. R.; Way, L. W. (Dep. Surg., Univ. California, San Francisco, Calif.). *Gastroenterology* 68(4):1009, 1975.

6711 DIFFERENTIAL GI SMOOTH MUSCLE EFFECTS BY INTRADUODENAL ADMINISTRATION OF SEVERAL FATTY ACIDS. *(E.)* Stewart, J. J.; Bass, P. (Univ. Wisconsin Cent. Health Sci., Madison, Wis.). *Gastroenterology* 68(4):991, 1975.

6712 INFLUENCE OF GASTROINTESTINAL HORMONE STIMULATION AND LUMINAL VOLUME ON GALLBLADDER FUNCTION. *(E.)* Ryan, J.; Cohen, S. (Hosp. Univ. Pennsylvania, Philadelphia, Pa.). *Gastroenterology* 68(4):977, 1975.

6713 ENHANCING ACCOMODATION OF THE CANINE GASTRIC FUNDUS WITH PENTAGASTRIN. *(E.)* Okike, N.; Kelly, K. A. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 68(4):964, 1975.

6714 THE EFFECT OF GASTRIN, CHOLECYSTOKININ-PANCREOSIMIN [SIC!], AND SECRETIN ON THE INTERACTION OF THE MOTOR FUNCTION OF THE STOMACH, DUODENUM AND BILIARY TRACT. *(Rus.)* Barashkova, G. M. (I. P. Pavlov Inst. Physiology, Leningrad, USSR). *Fiziol. Zh. SSSR* 61(5):763-773, 1975.

6715 ACTION MECHANISM OF BISACODYL ON THE SMOOTH MUSCULATURE OF THE SMALL AND LARGE INTESTINE IN GUINEA PIGS. *(Ger.)* Schubert, E.; Strunz, U.; Mitznegg, P.; Domschke, S.; Domschke, W.; Demling, L. (Pharmacological Inst., Univ. Erlangen, Erlangen, Germany). *Arzneim. Forsch.* 25(7):1053-1056, 1975.

6716 MODE OF ACTION OF SPASMOGENS (K, ACETYLCHOLINE, Ba) AND RELAXANTS (ISOPROTERENOL, Mn, PAPAVERINE) ON THE EXCISED JEJUNUM OF THE MOUSE, PARTICULARLY IN RELATION TO Ca. *(Jpn.)* Kaniyashiki, E. (Kobe Univ. Sch. Medicine, Ikuta-ku, Kobe 650, Japan). *Folia Pharmacol. Jpn.* 70(5):589-601, 1974.

6717 ON PARTICIPATION OF THE CAT COLON'S INTRAMURAL SYSTEM IN ORGANIZATION OF ITS RHYTHMIC CONTRACTILITY IN SITU. *(Rus.)* Pakhomov, A. I.; Stepanov, I. I.; Bukreeva, N. N.; Khoptiar, V. P. (1st Leningrad Medical Inst. USSR, Leningrad, USSR). *Fiziol. Zh. SSSR* 61(5):731-737, 1975.

6718 GASTRIC EMPTYING AND INTESTINAL TRANSIT AFTER DISULFIRAM TREATMENT IN RAT. *(Fr.)* Lambeouf, Y.; Fritsch, P.; De Saint-Blanquat, G. (INSERM U-87, F 31400 Toulouse, France). *Biol. Gastroenterol. (Paris)* 8(1):39-44, 1975.

6719 MODIFICATIONS OF THE ELECTRIC ACTIVITY OF THE PROXIMAL COLON IN THE RABBIT IN VIVO BY STIMULATION OF THE VAGAL AND SPLANCHNIC NERVES. *(Fr.)* Jule, Y. (C.N.R.S., INP 1, 31 chemin Joseph Aiguier, 13274 Marseille Cedex 2, France). *J. Physiol. (Paris)* 70(1):5-26, 1975.

6720 TWO TYPES OF GASTRIC MOTOR RESPONSE TO ATROPINE ADMINISTERED INTRAVENOUSLY. *(Cz.)* Enderle, E.; Pallova, S. (Inst. Postgraduate Medicine Pharmacy, Praha 4, Budejovica 800, Czechoslovakia). *Cesk. Gastroenterol. Vyz.* 28(8):545-550, 1974.

6721 INFLUENCE OF AUTOGENOUS RELAXATION ON OESOPHAGEAL MOTILITY. *(Ger.)* Berner, P.; Fink, G.; Naske, R.; Stacher, G. (Psychiatrischen Universitatsklinik Wien, Vienna, Austria). *Z. Psychosom. Med. Psychoanal.* 20(4):384-390, 1974.

6722 BIOPOTENTIALS OF THE STOMACH SMOOTH MUSCLES AND ITS MOTILITY. *(Rus.)* Ustinov, V. N. (Pavlov's Inst. Physiology, Leningrad, USSR). *Fiziol. Zh. SSSR im. I.M. Sechenova* 61(4):620-627, 1975.

See also, 6600, 6762, 7074, 7160, 7485.

SECRETION AND METABOLISM

6723 EFFECT OF CROMOLYN SODIUM AND DEUTERIUM OXIDE ON ANAPHYLACTIC HISTAMINE RELEASE FROM RAT PERITONEAL MAST CELLS IN VITRO. *(Eng.)* Herzig, D. J.; Kusner, E. J. (Warner-Lambert Res. Inst., Morris Plains, N. J. 07950). *J. Pharmacol. Exp. Ther.* 194(2):457-462, 1975.

The effect of deuterium oxide and cromolyn sodium on anaphylactic histamine release from rat peritoneal mast cells was studied *in vitro*. Mast cells from 6-wk-old male Sprague-Dawley rats were sensitized *in vitro* with rat reaginic antiovalbumin and challenged with ovalbumin, D_2O, and/or cromolyn sodium. After 5 min, the cells were removed from the medium, which was assayed for histamine using fluorometric techniques. At 37 C, D_2O caused a concentration-dependent potentiation of anaphylactic histamine release from the mast cells; there was a 1.3-fold potentiation with 5% (v/v) D_2O and a three-fold potentiation at 25% D_2O (v/v). At these concentrations, D_2O had no effect on spontaneous histamine release. The high rate of histamine release in 25% D_2O was not attributed to mast cell destruction, as trypan blue was actively excluded by the cells under these conditions. When the sensitized cells were challenged with antigen at 25 C in the presence and absence of D_2O, the D_2O proportionately increased both the rate of histamine release and the total amount of histamine released, so that half-time of release was not affected by D_2O. The concentration of cromolyn sodium required to obtain 50% inhibition of histamine release increased from 6 μM without D_2O to 80 μM in 10% D_2O and to greater than 500 μM in 25% D_2O. However, the graph showing the relationship between cromolyn sodium concentration and percent histamine release was not shifted in a parallel manner by D_2O. This suggests that the interaction between D_2O, cromolyn sodium, and the histamine-releasing processes of mast cells is not a simple one.

6724 STUDIES ON THE CALCEMIC EFFECT OF INTRAVENOUS SECRETIN IN HUMANS. *(E.)* Schwille, P. O.; Scholz, D.; Samberger, N. M.; Kayser, P. E. (Mineral Metabolism Lab., Univ. Erlangen-Nürnberg, Erlangen, West Germany). *Acta Hepato-Gastroenterol.* 22(3):195-200, 1975.

To elucidate the nature of observed hypercalcemia after secretin administration, patients with duodenal ulcer (Group 1), primary hyperparathyroidism (Group 2), one case of excluded antrum, and normal subjects were evaluated after infusion of pure, natural secretin (3 U/kg/hr), after a 12-hr fast. The average control increment in total Ca was 0.45 mg/100 ml after 45 min of infusion; Groups 1 and 2 had increments of 0.75 mg/100 ml after 90 min of infusion. A highly significant correlation was found between protein-bound Ca and total protein in Group 1 only. Inorganic plasma P dropped slightly in Group 2 and in controls, but remained stable in Group 1. Baseline-ionized Ca values remained stable in all groups. A slight but significant mean fall in gastrin was seen in controls and in Group 1.

Group 2 had a slight rise in gastrin, but this could be due to a variance in the assay procedure. The integrated gastrin response revealed no difference between the groups. All subjects had a small rise in glucagon; values for Group 2 were significantly higher than controls. Integrated glucagon showed that α cells in Group 2 maintained a high hormone output. Urinary excretion of P, Ca, and Na were normal in controls and in Group 1, and higher in Group 2 (as expected). Together with the data from the patient with excluded antrum, it is concluded that the hypercalcemic effect of secretin is not mediated by Ca regulatory hormones, but must be of an unspecific nature.

6725 THE EFFECT OF SUBDIAPHRAGMATIC VAGOTOMY ON METABOLISM OF IRON IN RATS. *(Rus.)* Eletskii, Iu. K.; Tsibulevskii, A. Iu.; Bolshakova, G. A. (N. I. Pirogov 2nd Moscow Medical Inst., Moscow, USSR). *Dokl. Akad. Nauk SSSR* 222(5):1252-1253, 1975.

6726 INHIBITION OF HEPATIC DRUG-METABOLIZING ENZYMES BY THIOPHOSPHATE INSECTICIDES AND ITS DRUG TOXICOLOGICAL IMPLICATIONS. *(E.)* Uchiyzmz, M.; Yoshida, T.; Homma, K.; Hongo, T. (Pharmaceutical Inst., Tohoku Univ., Sendai, Japan). *Biochem. Pharmacol.* 24(11-12):1221-1225, 1975.

6727 REGULATION OF PROTEIN SECRETION AND METABOLISM IN RAT SALIVARY GLANDS. EFFECTS OF NOREPINEPHRINE AND CARBACHOL ON THE GLYCOGENOLYSIS IN SUBMAXILLARY GLANDS. *(E.)* Herman, G.; Rossignol, B. (Inst. Biochimie, Univ. Paris-Sud, Orsay, France). *Eur. J. Biochem.* 55(1):105-110, 1975.

See also, 6634, 6905, 7036.

SECRETION AND METABOLISM

Stomach

6728 ARE NON-ABSORBABLE INDICATORS OF COMPARABLE VALUE IN THE HUMAN STOMACH MADE ABNORMAL BY TAUROCHOLIC ACID? *(E.)* Ivey, K. J.; Parsons, C. (R. Prince Alfred Hosp., Sydney, Australia). *Clin. Exp. Pharmacol. Physiol.* 2(2):151-157, 1975.

Chromium-51 ($^{51}CrCl_3$) and phenolsulfonphthalein (phenol red) were compared as nonabsorbable indicators of gastric secretion and emptying in the human stomach before and after alteration of the ionic permeability of the gastric mucosa by taurocholate. Nasogastric tubes were positioned in the fasting stomachs of healthy male volunteers and a 200 ml portion of test solution containing 160 mM HCl, phenol red, $^{51}CrCl_3$, and polyethylene glycol (PEG) was introduced; in some tests, the test solution also contained 10 mM taurocholic acid. The indicators were measured in the original test solution and in gastric aspirates obtained immediately after ingestion of the test solution and at intervals 15 and 30 min later. The ratios of the initial and final concentrations of the indicators (C_i:C_f) were compared. Correlation coefficients of the C_i:C_f ratios for $^{51}CrCl_3$ and phenol red were 0.91 in the control studies and 0.75 after taurocholic acid instillation; there was no significant difference with either indicator. During taurocholic acid instillation, the C_i:C_f values tended to fall in comparison with the control values. In a smaller number of subjects in whom PEG was also measured, the results were similar to those obtained with $^{51}CrCl_3$ and phenol red. The results therefore indicate that $^{51}CrCl_3$, phenol red, and PEG are comparable indicators in the normal human stomach and in the stomach made abnormal by a lipid-soluble agent such as unionized tarurcholic acid, although the correlation between indicators is reduced in the abnormal stomach. No evidence of increased absorption of any indicator was found in spite of the increased ionic permeability produced by taurocholic acid.

6729 RADIOAUTOGRAPHIC AND QUANTITATIVE STUDIES ON PARIETAL AND PEPTIC CELL KINETICS IN THE MOUSE. *(E.)* Willems, G.; Lehy, T. (Hopital Bichat, Paris, France). *Gastroenterology* 69(2):416-426, 1975.

Radioautography after *in vivo* labeling with (^{3}H)thymidine (1 μc/gm, i.p. on the third, fourth, and fifth days) was used to estimate DNA synthesis in progenitor cells and parietal and peptic cell proliferation during the chronic administration of natural gastrin (10 μg in 0.2 ml saline s.c. every 8 hr for 20 days) to male Swiss albino mice. The stomachs were examined 0-14 days after the last (^{3}H)-thymidine injection. The gastrin-treated mice did not differ from a group of saline-treated controls in terms of body weight gain, and no macroscopic or microscopic ulcers were seen in the gastric mucosa at the time of death. At 0 days after the termination of (^{3}H)thymidine treatment, few labeled parietal cells were seen in either the gastrin-treated or control mice; most labeled cells were undifferentiated or mucous cells. Thereafter, the population of labeled parietal cells increased significantly, reaching a peak level (254.15 labeled cells/5000 parietal cells) on the fifth day after termination of (^{3}H)thymidine treatment in the controls and on the third day in the gastrin-treated animals. In comparison with the controls, there was a 1.27% excess production of new parietal cells/day in the gastrin-treated animals, and after 20 days of gastrin treatment there was a 20% excess in total parietal cells. More than 95% of the new cells in both groups originated in the "superficial parietal cell area." The controls and gastrin-treated mice did not differ in terms of the proliferative activity of the peptic cells; the ratio of peptic cells to parietal cells was significantly reduced in the gastrin-treated mice at the termination of gastrin treatment. The data indicate that more than 95% of the parietal cells originate from the differentiation of immature progenitor cells in the neck area of the glands and that most peptic cells are renewed through cell replication of other peptic cells. Gastrin augments the production of parietal cells *via* acceleration of the maturation process of progenitor cells into parietal cells, increased duplication of progenitor cells, and augmentation of the proportion of stem cells being transformed into parietal cells.

6730 EFFECT OF PROLONGED ADMINISTRATION OF HOMOLOGOUS AND HETEROLOGOUS INTRINSIC FACTOR ANTIBODIES ON THE PARIETAL AND PEPTIC CELL MASSES AND THE SECRETORY FUNCTION OF THE RAT GASTRIC MUCOSA. *(E.)*

Inada, M.; Glass, G. B. J. (New York Medical Coll., New York, N.Y. 10029). *Gastroenterology* 69(2):396-408, 1975.

To determine the effects of circulating intrinsic factor antibodies (IFA) on gastric morphology and secretory function, female Sprague-Dawley rats were given daily i.v. injections of immunoglobulin G (IgG, 4 mg in 0.5 ml of normal saline). The IgG fractions were separated on DEAE cellulose columns from sera of patients with pernicious anemia, containing both IFA and parietal cell antibodies (PCA); sera from patients with atrophic gastritis, containing PCA only; or sera from rabbits immunized with semipurified human or rat IF. Control rats were treated with saline or IgG processed from normal human or rabbit sera, or were untreated. One-third of each group was intubated biweekly after fasting and histamine stimulation (0.1 mg/kg, s.c.) and the hourly output of HCl, pepsin, and IF were determined. At the end of the experiment, the rats were killed and the mucosal surface and thickness were measured; the parietal cell and peptic cell masses were counted at the same time. In the control groups, there was either no change or a progressive growth in the cellular mass of the gastric mucosa; the latter was accompanied by no change or an increase in the HCl, pepsin, and IF outputs. In contrast, the rats injected with IgG containing IFA to human or rat IF showed a statistically significant thinning of the gastric mucosa, a reduction in peptic cell number, and corresponding decreases in the output of pepsin and IF. The latter were reduced 50% from the initial values and 62 and 75%, resp., when compared with the normal human and rat IgG-injected controls. In animals injected with the IgG fractions from the pernicious anemia sera, the output of IF, pepsin, and HCl was significantly decreased, as were the peptic and parietal cell masses. Thinning of the gastric mucosa, a reduction in the parietal cell mass, and a significant decrease in the HCl output were observed in the rats injected with the atrophic gastritis IgG; the outputs of pepsin and IF were also significantly reduced in these animals. The data suggest the participation of humoral immunological mechanisms in the production of gastric atrophy and secretory failure.

6731 UNIQUE ENZYMES OF PURIFIED MICROSOMES FROM PIG FUNDIC MUCOSA: K$^+$-STIMULATED ADENOSINE TRIPHOSPHATASE AND K$^+$-STIMULATED pNPPase. *(E.)*

Forte, J. G.; Ganser, A.; Beesley, R.; Forte, T. M. (Dept. Physiology-Anatomy, Univ. California, Berkeley, Calif. 94720). *Gastroenterology* 69(1):175-189, 1975.

The microsomal fraction from pig fundic gastric mucosa was assayed for the presence of K$^+$-stimulated ATPase and K$^+$-phosphatase activities. The microsomal fraction was isolated by differential centrifugation and density gradient fractionation. In addition to the enzyme assays, determinations of the microsomal protein content and RNA were made, and the membrane fractions were studied by electron microscopy. The microsomal fractions showed high levels of K$^+$-stimulated ATPase and K$^+$-stimulated phosphatase activity, while similar preparations from antral mucosa showed virtually no such activity. A low density band of membranes from the fundic preparations (peak 1.12-1.13 g/ml) possessed all of the K$^+$-stimulated enzyme activities. The morphological features and abundant glycoproteins of this fraction suggested that the low density microsomes might be derived from the tubulovesicles of oxyntic cells. Mitochondrial and ribosomal markers were associated with membranes with much higher densities (greater than 1.22 g/ml). The K$^+$-stimulated ATPase showed a pH optimum of 7.5 and required Mg^{++}, but neither Na$^+$ nor ouabain had any appreciable effect on the activity. K$^+$ stimulation of basal ATPase ranged from 1.5 to 3.0-fold with an apparent K_a for activation between 0.2 and 0.4 mM of K$^+$. The addition of various K$^+$ ionophoretic substances such as gramicidin resulted in up to 6-fold stimulation of the basal K$^+$-ATPase activity. The mean activities of seven separate preparations of purified low density pig fundic microsomes were (μM of ATP hydrolyzed/mg of protein/hr): basal ATPase, 15.8; basal ATPase plus 10 mM of K$^+$, 29.3; plus 10 mM of K$^+$ and 10^{-5} M of gramicidin, 45.2. Neither the basal ATPase nor the K$^+$-stimulated activities were altered by HCO$_3^-$ or Cl$^-$. The occurrence of these unique enzyme activities in the oxyntic region of the gastric mucosa suggests some relation with secretory activity, but further research is needed to elaborate the physiological function of this gastric system.

6732 MECHANISMS FOR CATECHOLAMINE DISENGAGEMENT FROM VARIOUS PARTS OF THE STOMACH AND THEIR ACCUMULATION IN GASTRIC TISSUE. *(Rus.)*

Mirzoian, S. A.; Virabian, T. L. (Erevan Med. Inst., USSR). *Zh. Eksp. Klin. Med.* 14(2):3-8, 1974.

The content of adrenalin and noradrenalin was compared in the blood flowing from the lesser and greater curvatures of the stomachs of dogs and in the walls of the isolated stomachs of rats under the influence of various doses of quateron and acetylcholine. The motor function of the lesser and greater curvatures of the stomach was recorded by an electrogastrograph with a set of platinum electrodes.

The content of adrenalin and noradrenalin was determined spectrofluorometrically. Results showed that i.v. introduction of acetylcholine (5 μg/kg), small doses of quateron (0.2 mg/kg), and irritation of the vagus nerve (by faradization) together with the enhancement of motor function of the stomach increased the catecholamine content in the blood, in the stomach, and in the tissues of the stomach walls. Larger doses of quateron (2 mg/kg) promoted the accumulation of catecholamines in tissues of the stomach walls, but inhibited the motor activity of the stomach and reduced the contents of adrenalin as well as of noradrenalin in the blood and in the stomach. This double effect of high doses of quateron is attributed to quateron's cholino-positive influence as a result of which the larger doses of quateron promote accumulation of catecholamines in tissues of stomach walls, simultaneously suppressing their disengagement from the stomach tissue.

6733 METABOLISM OF SYNTHETIC HUMAN GASTRIN AND DNS-GASTRIN IN RATS AND MICE. *(E.)* Matsuyama, T.; Kodama, M.; Nagao, Y. (Hiroshima Univ. Sch. Medicine, Japan). *Hiroshima J. Med. Sci.* 23(2/3):155-164, 1974.

The metabolism of synthetic human gastrin (SHG) and DNS-gastrin was studied in DDY mice and Wistar rats. ^{3}H-SHG (15 mg/kg) was injected into the tail veins of conscious mice and the animals were frozen 10 or 30 min later. The mice were then sectioned and examined by whole body autoradiogram. The experiment was repeated following the i.v. administration of ^{14}C-DNS-gastrin (1.3 mg/kg). In the second experiment, ^{3}H-SHG (200 μg/kg) was injected i.v. into normal rats and animals which had undergone bilateral nephrectomy; ^{14}C-DNS-gastrin was similarly injected into normal rats and animals which had undergone bile duct ligation. Blood was withdrawn 1 to 360 min after injection and its radioactivity determined. In a third experiment, ^{3}H-SHG (2.5 μg/kg) was injected i.v. into Wistar rats and the bile and urine were collected at 10 min intervals and respective radioactivities were determined. In the first experiment, strong radioactivity was seen in the renal cortex, renal pelvis, bladder contents, bladder mucosa, and gallbladder 10 min after ^{3}H-SHG injection. After 30 min, the concentration of label in the bladder contents and gallbladder had increased, but the activity in the renal cortex and liver was still strong. Ten min after ^{14}C-DNS-gastrin administration, there was a large amount of radiation in the liver, and after 30 min the gallbladder was markedly distended with strongly radioactive bile; there were also marked accumulations of activity in the kidney and bladder contents. In the second experiment, radioactivity tended to be retained in the blood longer in the nephrectomized rats than in the normal rats. The retention of radioactivity in the blood of the bile duct-ligated group was also markedly prolonged. In the third experiment, 44.9% of the total radioactivity was eliminated from the body within 3 hr; 33% was excreted in the urine and 11.9% was excreted in the bile. The data indicate that SHG is metabolized in the urinary system, mainly in the renal cortex, and that DNS-gastrin is primarily metabolized in the liver and bile duct.

6734 SYNTHESIS AND SECRETION OF PROTEIN AND PEPSINOGEN BY RABBIT GASTRIC MUCOSA IN ORGAN CULTURE. *(E.)* Sutton, D. R.; Donaldson, R. M., Jr. (Boston Univ. Sch. Medicine, Mass.). *Gastroenterology* 69(1):166-174, 1975.

The active synthesis and secretion of proteins, including pepsinogen, by gastric mucosal biopsies *in vitro* are reported. Mucosal biopsies were obtained from the stomachs of white New Zealand rabbits. To assess incorporation of amino acid into tissue protein, L-[1-^{14}C]leucine (2 μCi) was added to each ml of culture medium. Secretion of labeled proteins was studied by centrifugation and dialyzation, or in pulse-chase experiments with 5 μCi/ml of [^{14}C]leucine. Incorporation of radioactivity into tissue protein was linear with time up to 24 hr in continuous cultures; secretion was also linear after an initial lag of 3 to 6 hr. Biopsies cultured in an isotope-free medium and then transferred to a labeled medium showed the same rate of incorporation as in freshly-excised biopsies. Incorporation of radioactivity was inhibited 96% by cycloheximide at 0.5 mg/ml for 1 hr, and by 99% for 24 hr. Total pepsin activity in cultured biopsies did not decrease, but a linear increase was seen in the culture medium, at 24 hr corresponding to 40% of that originally present in the biopsies. Gel electrophoresis showed a single major peak of radioactivity approximating the position of a stained band of protein obtained during electrophoresis of hog pepsin. This also corresponded to the peak obtained by gel filtration. Ion exchange chromatography showed four peaks, each of which coincided with pepsin activity. Acetylcholine markedly stimulated secretion of labeled protein and pepsinogen. Acetylcholine, pentagastrin, secretin, and the octapeptide of cholecystokinin (in 10^{-10} M concentrations) stimulated protein secretion. Overall incorporation of radioactivity was stimulated by 10^{-9} M pentagastrin. These data indicate a direct *in vitro* effect of pentagastrin on protein synthesis, and suggest the *de novo* synthesis of pepsinogen by isolated gastric mucosa.

6735 IN VITRO INCORPORATION OF $^{35}SO_4$ INTO RAT GASTRIC POLYANIONS AND THEIR DEGRADATION BY GASTRIC ENZYMES. *(E.)* Liau, Y. H.; Horowitz, M. I. (New York Medical Coll., Valhalla, N.Y. 10595). *Digestion* 11(5-6):370-381, 1974.

The *in vitro* incorporation of ^{35}S-sulfate into gastric polyanions was studied using whole stomach (mucosa and muscle) and cartilage from a male Sprague-Dawley rat. Pieces of this tissue were incubated for 16 hr in Joklik-modified minimum essential medium containing 100 μCi $Na_2{}^{35}SO_4$. The gastric polyanions from the stomach tissue, incubation medium, and rib-cartilage were subsequently fractionated and the fractions analyzed by thin-layer chromatography, cellulose acetate electrophoresis, paper electrophoresis, and scintillation counting. The sulfatase activity of crude gastric enzyme toward each fraction was also determined. ^{35}S-sulfate was incorporated into the acidic mucopolysaccharides, various glycoprotein fractions, and sulfatides of the tissue and medium. More radioactive sulfate was incorporated into the soluble and medium components than into the tissue-bound components, and the distribution of ^{35}S in stomach fractions was quite different from that in rib fractions. Detergent fractionation and electrophoresis suggested the presence of sulfated polyanions not previously described for this tissue. In the studies with crude gastric enzyme, inorganic sulfate was liberated only from the fractions containing chondroitin sulfates. The gastric enzyme also liberated organic sulfates from chondroitin sulfates and from sulfated glycoproteins. The results suggest that sulfation in the stomach tissue occurred in a wide variety of polyanions besides the chondroitin sulfates, that partial desulfation of the chondroitin sulfates had occurred before isolation from the tissue, that a significant mucolytic action may occur in stomach tissue, and that the majority of ^{35}S-labeled substances were probably composed of glycoproteins.

6736 VITAMIN B_{12}-BINDING PROTEINS IN HUMAN GASTRIC MUCOSA: GENERAL PATTERN AND DEMONSTRATION OF INTRINSIC FACTOR ISOPROTEINS TYPICAL OF MUCOSA. *(E.)*

Marcoullis, G.; Gräsbeck, R. (Minerva Foundation Inst. Medical Res., P. O. Box 819, SF-00101, Helsinki 10, Finland). *Scand. J. Clin. Lab. Invest.* 35(1):5-11, 1975.

The nature of intrinsic factor in human gastric mucosa was studied. Submucosal and mucosal homogenates were prepared from stomach specimens taken at surgery. Only macroscopically normal-appearing tissue was used. Samples were analyzed by gel filtration, cellulose column chromatography and isoelectric focusing. For logical indentification of vitamin B_{12}-binding proteins, a serum from a patient with pernicious anemia with antibodies binding the B_{12}-intrinsic factor complex and a rabbit antiserum against a crude preparation of a B_{12}-binding protein were used. Sedimentation coefficients were also estimated. After gel filtration of 2 to 3 ml samples of mucosal extracts, radioactive peaks were identified as the B_{12} complexes of R protein and intrinsic factor. The B_{12}-intrinsic factor peak disappeared after addition of pernicious anemia and rabbit antisera. A small quantity of transcobalamin II was also detected. The molecular weight of the mucosal complex was shown to be about 1,400 daltons less than that of the gastric juice complex. Isoelectric focusing showed that mucosal extract contained components with pI's that were closer to neutral than to those of gastric juice. The presence of these neutral components (N-components) was also demonstrated by column chromatography. After isoelectric focusing, one N-component resolved into components isoelectric at pH 5.95, 6.25 and 6.52. Simultaneous centrifugation of mucosal and gastric juice B_{12}-intrinsic factor complexes showed no difference in sedimentation rate. When they were centrifuged together with leukoagglutinin, a sedimentation coefficient of 4.1S was obtained for the B_{12}-intrinsic factor complex. It is suggested that the intrinsic factor isoprotein phenomenon in gastric juice and mucosa is best explained by a similar polypeptide chain binding carbohydrate chains, which vary in sialic acid composition and also with respect to other carbohydrates.

6737 A HISTOCHEMICAL APPROACH TO THE CHOLINERGIC INNERVATION OF ENDOCRINE-LIKE CELLS IN DOG ANTRO-PYLORIC MUCOSA. *(E.)*

Yamaguchi, I.; Mori, J.; Honda, F.; Nishizaki, H.; Kumada, S. (Fujisawa Pharmaceutical Co. Ltd., Yodogawa-Ku, Osaka, Japan). *Jpn. J. Pharmacol.* 24(5):721-728, 1974.

The cholinergic innervation of endocrine-like cells was studied in such a way so that the cells and the acetyl cholinesterase activity were demonstrated by formaldehyde-HCl treatment and the acetylthiocholine method, resp. The cholinergic innervation of endocrine-like cells in the antropyloric areas was compared with that of exocrine cells in the fundic gland. Tissue sections were taken from the stomachs of anesthetized mongrel dogs. Sections were fixed, stained and examined by fluorescence and light microscopy. Acetyl cholinesterase staining showed cholinergic nerve fibers with a wide distribution in the fundic mucosa, especially in the middle area. Nerve fibers were also seen in close proximity to the base of secretory cells, a few in the superficial 1/5 of the mucosa and large bundles emanated from the submucosa. In comparison, chief cells were arranged in a single layer around the gastric lumen, and were distributed in the lower 2/3 of the mucosa. The arrangement of parietal cells was similar. Most cholinergic nerve fibers were distributed in the basal 1/2 or 1/3 of the antropyloric mucosa, and stained more lightly for acetyl cholinesterase activity than those in the fundic mucosa. Transverse sections of pyloric glands were surrounded by cholinergic nerve fibers. Standard formaldehyde treatment showed endocrine-like cells with cytoplasmic granules arranged in a single layer around the gastric lumen, and some eterochromaffin cells. After exposure to HCl, the endocrine-like cells were strongly fluorescent, and the fluorescence of the enterochromaffin cells and adrenergic nerve fibers was strongly reduced or abolished. These findings suggest the direct involvement of cholinergic innervation in the secretion of pepsin and HCl acid. It is further concluded that gastrin release is controlled by the cholinergic nerve fibers innervating gastrin-containing cells.

6738 EVIDENCE OF NONVAGAL NEURAL STIMULATION OF CANINE GASTRIC ACID SECRETION. *(E.)*

Tansy, M. F.; Probst, S. J.; Martin, J. S. (Temple Univ. Health Sciences Center, Philadelphia, Pa.). *Surg. Gynecol. Obstet.* 140(6):861-867, 1975.

Gastric secretory responses to central vagal stimulation were studied in male and female mongrel dogs during suppression of alpha-adrenergic effects. A cannula was inserted into the common bile duct of the fasted dogs for external diversion of the bile and a Thomas cannula was placed into the corpus of the stomach for collection of the gastric juice. Gastric acid secretion in response to electrical stimulation of the vagosympathetic trunks was studied before and after the i.v. administration of phenoxygenzamine hydrochloride, atropine sulfate, and burimamide hydrochloride. The response was also tested following surgical interruption of the splanchnic nerves and direct electrical stimulation of the peripheral ends of these nerves. Central vagal stimulation subsequent to alpha-adrenergic blockade was associated with marked elevations in the total volume of gastric secretion and in acidity. The response was not blocked by a subsequent large dose of atropine. Acid secretion was never obtained from the gastric mucosa on phenoxybenzamine hydrochloride stimulation. The reflex increase in gastric acid secretion during alpha-adrenergic blockade was abolished by surgical interruption of the splanchnic nerves and reinstituted by direct stimulation of these nerves. The latter response was not completely blocked by atropine but was abolished by burimamide. Burimamide also abolished the elevated acid secretory response produced by multiple central stimulation of both vagi during alpha-adrenergic blockade. It is concluded that a heretofore unsuspected second neural pathway exists in the dog which is capable of influencing gastric acid secretion.

6739 EFFECT OF CONTINUOUS INFUSION OF PENTAGASTRIN ON LOWER ESOPHAGEAL SPHINCTER PRESSURE AND GASTRIC ACID SECRETION IN NORMAL SUBJECTS. *(E.)*

Walker, C. O.; Frank, S. A.; Manton, J.; Fordtran, J. S. (Dallas Veterans Admin. Hosp., Dallas, Tex. 75216). *J. Clin. Invest.* 56(1):218-225, 1975.

The effect of a continous 1-hr infusion of pentagastrin on lower esophageal sphincter (LES) pressure was studied, and was correlated with the acid secretory response by stomach parietal cells. In the first period of study, isotonic saline was infused i.v. for 30 min (control). Pentagastrin was then infused i.v. for 1 hr. The third period was begun by replacing the pentagastrin infusion with saline for 40 min. The effects of different doses of pentagastrin were measured in different groups of from eight to 13 normal subjects (group dose-response studies); two subjects had a complete dose-response examination (four or five studies at each of seven doses; individual dose-response studies). Results of the group dose-response studies showed that gastric acid secretion was significantly stimulated by infusion of 0.025 μg/kg/hr and higher doses of pentagastrin. There was no significant elevation in LES pressure during 1-hr infusion of pentagastrin (0.004-12 μg/kg/hr). An i.v. bolus injection of pentagastrin (0.5 μg/kg/hr) together with 0.9 and 1.5 μg/kg/hr pentagastrin infusion significantly increased LES pressure. The results of the individual dose-response studies showed that in the first subject, LES pressure was increased from 37 to 50 mm of Hg with the 0.9 μg/kg/hr infusion of pentagastrin alone. The same infusion rate in the other subject increased LES pressure from 38 to 49 mm of Hg. In both these subjects, this dose of pentagastrin elicited secretion rates of gastric acid equal to those induced by a 12 μg/kg/hr infusion. The calculated half-maximal dose for acid secretion was 0.15 μg/kg/hr for the first subject and 0.35 μg/μg/hr for the second subject. There was no significant correlation between acid secretion rate and LES pressure. These results are in contrast to previous findings and suggest that serum gastrin may not be the major determinant of LES pressure.

6740 PLASMA SHEDDING BY THE CANINE OXYNTIC AND PYLORIC GLANDULAR MUCOSA INDUCED BY TOPICAL ACTION OF ACETYLCHOLINE: EFFECT OF ATROPINE AND PHYSOSTIGMINE. *(E.)*

Davenport, H. W.; Kauffman, G. L., Jr. (Dept. Physiology, Univ. Michigan, Ann Arbor, Mich.). *Gastroenterology* 69(1):190-197, 1975.

The effects of various drugs on the acetylcholine-induced shedding of plasma proteins by the oxyntic glandular mucosa were studied in dogs with Heidenhain pouches or vagally denervated antral pouches. The fasted animals were injected i.v. with Evans blue (25 mg) and 40 ml of buffer was placed in the Heidenhain pouch or 20 ml was placed in the antral pouch. After 30 min, the volume of fluid in the pouch was measured and the fluid was analyzed for the presence of dye. This procedure was repeated following the placement of 20 or 40 ml of acetylcholine bromide in the pouch. The effects of topical and/or i.v. atropine sulfate, gallamine triethiodide, physostigmine, d-tubocurarine, and succinylcholine were also studied. Irrigation of the Heidenhain and antral pouches with acetylcholine caused the mucosa to shed plasma protein and caused the potential differences across the mucosa to fall. The response was dose-related, with the minimum effective concentration of acetylcholine bromide ranging from 0.1 to 1.0 g/100 ml. Topical atropine (50 mg/100 ml) completely blocked the effects of acetylcholine on plasma shedding and potential difference, a similar effect being produced by i.v. atropine (0.2 mg/kg). The minimal effective dose of atropine varied between 0.005 and 0.0125 mg/kg. The effect of low concentrations of acetylcholine was enhanced by concurrent irrigation with physostigmine (minimal effective dose, 0.3 mg/100 ml), but was not affected by concurrent irrigation (0.5 g/100 ml) with or i.v. (5 mg/kg) hexamethonium chloride. Similarly, the effects of acetylcholine on plasma shedding were not prevented by topical gallamine triethiodide (0.5 g/100 ml) or *d*-tubocurarine (0.15 g/100 ml). Topical succinylcholine chloride (1 g/100 ml) did not cause plasma shedding or a fall in potential difference. The data suggest that although high concentrations of acetylcholine are needed to cause plasma shedding, only a small amount of the applied acetylcholine acts at some relatively inaccessible site.

6741 FAILURE OF CHOLESTRYAMINE TO PREVENT BILE SALT INJURY TO MOUSE GASTRIC MUCOSA. *(E.)*

Eastwood, G. L. (U.S. Naval Hosp., Philadelphia, Pa.). *Gastroenterology* 68(6):1466-1472, 1975.

The effects of cholestryamine on bile salt-induced injury to the mouse gastric mucosa were studied. Solutions of taurocholate or glycochenodeoxycholate, with or without added cholestyramine resin (9 mg/ml), were instilled into the stomachs of fasted mice at pH 1, 3, 5, or 7. Sections of the greater curvature were subsequently examined by light microscopy and graded as normal, mildly injured (spotty changes in the cellular staining characteristics of some surface epithelial cells), moderately injured (more generalized changes and/or disruption of the surface epithelium in several places), or severely injured (extensive mucosal destruction). Cholestyramine alone caused mild injury at pH 1, but produced no detectable injury at pH 7. At pH 1, all mice receiving 0.1 or 2 mM taurocholate, with or without cholestyramine, had gastric mucosal damage. At pH 3, 5, and 7, taurocholate produced no changes. Glycochendeoxycholate caused injury at pH 1 and 3, the damage being slightly but insignificantly reduced by cholestyramine. The *in vitro* binding of 2 mM taurocholate by cholestyramine (4 mg/ml) was nearly complete at pH 3, 5, and 7, and at 20 mg/ml, cholestyramine was able to bind 89% of the bile salt at pH 1. The results suggest that for cholestyramine to be effective in binding the bile salts in the treatment of gastric ulcer, cholestyramine would have to be administered in greater quantity than the usual 4 g three times/day and/or the pH of the stomach would have to be maintained above 4-5 by the frequent administration of antacids.

6742 THE EFFECT OF VITAMIN A ON GASTRIC MUCUS AND STRESS ULCERATION IN THE RESTRAINED RAT. *(E.)* Wilson, S. E.; Hiatt, J. R.; Davis, R. S. (Veterans Admin. Wadsworth Hosp. Center, Los Angeles, Calif.). *Surg. Italy* 4(1):35-40, 1974.

Mucus production and the effects of vitamin A on mucus production and stress ulceration were studied in normal and restraint-stressed Wistar rats. In the first experiment, 120 rats were restrained for 12, 18, or 24 hr, with one-half of the rats serving as controls and the rest injected s.c. with aqueous vitamin A (5000 U) immediately prior to restraint. In the second experiment, 59 rats were fasted for 24 hr (controls) or restrained for 24 hr, and/or injected s.c. with aqueous vitamin A (5000 U). After both studies, the animals' stomachs were opened along the greater curvature and checked for evidence of ulceration; after the second study, the gastric mucosa was also analyzed for hexosamine, a primary constituent of mucus. In the first experiment, the ulcerative index in all animals increased with the duration of stress. In the animals pretreated with vitamin A, the number of ulcers was significantly lower after each period of stress restraint, particularly after 24 hr of restraint. In the second experiment, the average hexosamine content in the control mucosa was 0.56 mg/0.1 g while in untreated stressed rats, this value was significantly reduced to 0.36 mg/0.1 g. The mucosal hexosamine content in stressed rats pretreated with vitamin A did not differ significantly from that of the untreated stressed rats. Vitamin A did not significantly increase mucus levels in either the stressed or unstressed rats. It is concluded that vitamin A reduces the severity of acute mucosal ulceration in the stressed rat, that the hexosamine content of the superficial gastric mucosal layer is decreased with stress ulceration, and that vitamin A does not appear to significantly increase mucus production in stress ulceration.

6743 GASTRIC ACID SECRETION AND SLEEP STAGES DURING NATURAL NIGHT SLEEP. *(E.)* Stacher, G.; Presslich, B.; Starker, H. (1 Chir. Univ. Klinik, Alserstr 4, A-1097, Wien, Austria). *Gastroenterology* 68(6):1449-1455, 1975.

The relation between wakefulness and the different stages of natural night sleep and gastric acid secretion was studied in four healthy female volunteers for 11 nights. Measurement of gastric acid secretion was carried out by means of the intragastric titration technique and a telemetering capsule swallowed at the commencement of each experiment. Electroencephalogram recordings and eye movements were continuously monitored by monopolar scalp and bipolar facial leads. Acid output was determined prior to the onset of sleep, after awakening, during arousals and longer periods of wakefulness in the course of the night, and during the different stages of sleep. Compared with the waking state, sleep was associated with significantly reduced levels of acid secretion. Although there were no significant differences between acid secretion during sleep stages 1-4 and rapid eye movement (REM) sleep, acid secretion decreased in the deeper stages of sleep. During all REM phases, only small amounts of acid were produced. Arousal or periods of waking in the course of the night, as well as waking in the morning, were associated with significant increases in acid output. The high rate of secretion was maintained during the whole period after wakening, as long as the subject did not fall asleep again. Similar studies should be performed in duodenal ulcer patients.

6744 PYLORIC REFLUX GASTRITIS: THE OFFENDING AGENT. *(E.)* Delaney, J. P.; Broadie, T. A.; Robbins, P. L. (Univ. Minnesota Health Sciences Center, 412 S.E. Union St., Minneapolis 55455). *Surgery* 77(6):764-772, 1975.

The abilities of bile, pancreatic juice, and whole intestinal contents to induce morphologic changes in the canine gastric mucosa were compared. Full-thickness tubes were fashioned from the greater curvature of the canine stomach, pedicled on the short gastric vessels, and interposed in the upper jejunum of 12 dogs. In a second group of dogs, the segment of duodenum bearing the main pancreatic duct was anastomosed to the gastric tube, thereby exposing the stomach corpus mucosa to essentially pure pancreatic juice. In the third group of animals, bile was diverted over the gastric mucosa by ligating the common bile duct and anastomosing the gallbladder to the gastric tube. Biopsies of the tube and parent stomach were obtained at initial surgery and four months to two yr later; the specimens were compared with respect to parietal cell number, mucus cell number, inflammation, glandular disorder, and surface-cell hyperplasia. Exposure of the stomach mucosa to whole intestinal contents resulted in a 56% reduction in parietal cell density compared with a normal control group, while exposure to pancreatic juice resulted in a 49% reduction and exposure to bile in a 32% reduction. The degree of inflammation and mucus cell hyperplasia was also greater in mucosa exposed to intestinal juice than in mucosa exposed to pancreatic juice or bile; all three groups differed significantly from the controls. The overall gastritis scores did not differ significantly between the bile and pancreatic juice groups, but that of the intestinal juice group was significantly greater than those of the other two groups. The experimental gastric mucosa also differed from the control mucosa in the appearance of cysts in the deep glands of the mucosa, a disorderly appearance to the mucosa, and a reduction in chief cells; the experimental and control mucosa did not differ in mucosal thickness. The changes in the experimental mucosa did not progress with time. The data suggest that gastritis may result from long-term exposure to a mixture of enzymes, detergent substances, and endogenous acid.

6745 INCREASED PLASMA GASTRIN LEVELS IN CONNECTION WITH INHIBITION OF GASTRIC ACID RESPONSES TO SHAM FEEDING FOLLOWING BULBAR PERFUSION WITH ACID IN DOGS. *(E.)* Nilsson, G. (Dept. Pharmacology, Karolinska Institutet, S-104 01 Stockholm 60, Sweden). *Scand. J. Gastroenterol.* 10(3):273-277, 1975.

The effect of bulbar acidification on plasma gastrin and gastric acid responses to sham feeding was studied in two mongrel dogs with esophageal fistulas, gastric cannula, and mucosal septal pouches of the fundic stomach (Pavlov type) and duodenal bulb. Gastric secretion from the Pavlov pouches was determined during a basal period and after stimulation by sham feeding of minced cooked beef in water; the volume was measured and the acidity determined by titration with 0.01 N NaOH. Perfusion of the bulbar pouches with 0.9% NaCl or 0.1 N HCl was performed throughout the experiment and pH determinations of the effluent perfusates were performed at 15-min intervals. Gastrin concentrations in blood samples taken every 15 min were measured by radioimmunoassay. The gastrin-like immunoreactivity measured in this way behaved like the porcine gastrin standard. Cross-reactivity with cholecystokinin-pancreozymin, the only natural peptide known to significantly cross-react with antigastrin antisera, was negligible. Perfusion of the bulbar pouches with 0.1 N HCl profoundly inhibited the acid output from the Pavlov pouches in response to sham feeding, the acid responses from the gastric fistulas being similarly inhibited. Sham feeding increased plasma gastrin concentrations in both the control and inhibitory experiments, but these concentrations were much higher in the inhibitory experiments than in the control. The data support the hypothesis that the bulbar mechanism inhibits acid secretion by interfering with the stimulatory action of gastrin at the HCl-producing glands.

6746 EFFECT OF ACID IN THE DUODENAL BULB ON ACID AND PEPSIN RESPONSES TO TEST MEAL IN DOGS. *(E.)* Nilsson, G. (Dept. Pharmacology, Karolinska Institutet, S-104 01 Stockholm 60, Sweden). *Scand J. Gastroenterol.* 10(3):279-282, 1975.

The effect of acid in the duodenal bulb on gastric acid and pepsin secretion was studied in five dogs with innervated pouches of the fundic stomach (Pavlov type) and the duodenal bulb. Gastric acid and pepsin output and pepsin concentration in gastric juice were determined under basal conditions. The dogs were then fed a cooked beef liver meal and in some cases the bulbar pouches were perfused with 0.1 N HCl (80 ml/hr). The volume of gastric juice, pH of the effluent perfusate, and pepsin concentration were determined in 15-min samples collected over the following three hr. Bulbar perfusion with acid profoundly inhibited the secretion of acid from the gastric pouches, the average reduction being 68% of basal secretion. The total output of pepsin was also reduced to 41% of basal levels during bulbar acidification; in addition, the pepsin concentration in the gastric juice was generally lower during bulbar perfusion with acid. The data suggest that secretin is not the humoral agent response for the inhibition of acid secretion during bulbar acidification.

6747 EFFECT OF BULBAR PERFUSION WITH ACID, HYPERTONIC SOLUTIONS, AND ACETYLCHOLINE ON GASTRIC ACID SECRETION IN DOGS. *(E.)* Nilsson, G. (Dept. Pharmacology, Karolinska Institut, S-104 01 Stockholm 60, Sweden). *Scand. J. Gastroenterol.* 10(3):283-287, 1975.

The effects of bulbar perfusion with 0.1 N HCl, hypertonic solutions of 40% glucose, 40% peptone, or 40% NaCl, and 0.1% acetylcholine chloride on gastric acid secretion were studied in three mongrel dogs with Pavlov pouches of the fundic stomach and proximal portion of the duodenum; one dog was also provided with an isolated pouch of the distal duodenum. Beginning two hr before the bulbar perfusions, pentagastrin (40 μg/hr) in 0.9% saline was given as a continuous i.v. infusion for five hr. The gastric acid secretions were collected in 15-min samples. Bulbar perfusion with 0.1 N HCl profoundly inhibited acid secretion from the Pavlov pouches, while perfusion with glucose, NaCl, or peptone solutions had no significant influence on the average acid output. Perfusion with acetylcholine produced a transient inhibition of gastric secretion, the degree of inhibition varying from dog to dog. Perfusion of the distal duodenal segment in one dog with glucose did not significantly influence the gastric acid output. It is concluded that hypertonic solutions are not activators of the bulbar inhibitory mechanism which responds to reductions in the intrabulbar pH. Inhibition following bulbar perfusion with acetylcholine may indicate that the liberation of a hypothetical humoral agent, bulbogastrone, is to some extent under cholinergic control.

6748 IN VIVO STUDIES ON THE NEUTRALIZING EFFECT OF ANTACIDS USING THE HEIDELBERG CAPSULE. *(E.)* Ekenved, G.; Walan, A. (Res. Lab., AB Hassle, Molndal, Sweden). *Scand. J. Gastroenterol.* 10(3):267-272, 1975.

The effects of various antacid preparations on gastric pH were studied in six healthy volunteers, aged 23-43 yr. The intragastric pH was measured by the Heidelberg radiotelemetry capsule method and the aspiration technique. The *in vitro* rate of reaction between human gastric juice and the four antacid preparations [a liquid preparation, a chewable tablet (tablet A), and 2 tablets (tablets B and C) designed to be swallowed whole] was assayed by titration at constant pH. The preparations were given to fasting subjects in a dosage corresponding to a neutralizing capacity of 50-60 mEq HCl. At low pH levels (less than 2), the Heidelberg capsules recorded lower values than were obtained with the aspiration technique, but when the pH response to an antacid dose was studied the two techniques give concordant results. The liquid antacid preparation and tablet A give almost equivalent results, with a short latency period and a duration of action of more than one hr (mean 69 min and 82 min, resp.). Tablets B and C gave less prompt effects with a shorter duration of action (mean 45 min for both). The clinical interpretation of these results should be limited to situations involving an empty stomach.

6749 EFFECT OF URIDINE DIPHOSPHO-N-ACETYLGLUCOSAMINE AND SODIUM SALICYLATE ON L-GLUTAMINE-D-FRUCTOSE-6-PHOSPHATE AMINOTRANSFERASE ACTIVITY FROM RAT GASTRIC MUCOSA.

(E.) Chan, J.; Lee, K. H. (Sch. Pharmacy, Univ. California, San Francisco 94143). *J. Pharm. Sci.* 64(7):1182-1185, 1975.

The mechanisms of action of sodium salicylate and uridine-5'-diphospho-*N*-acetylglucosamine on L-glutamine-D-fructose-6-phosphate aminotransferase prepared from Sprague-Dawley rat gastric mucosa were studied, as were interactions between the two inhibitors. The effect of these two inhibitors on enzyme activity was determined by the rate of glucosamine formation in mucosal supernatant protein fractions during incubation in the presence of L-glutamine and glucose-6-phosphate. At 10-20 mM, sodium salicylate reversibly inhibited aminotransferase activity by competing with glucose-6-phosphate. At higher concentrations, salicylate inactivated the enzyme irreversibly, with an inactivation rate following first order kinetics with response to enzyme concentration. Uridine-5'-diphospho-*N*-acetylglucosamine, an endogenous feedback inhibitor, also inhibited the aminotransferase-catalyzed reaction by competing with glucose-6-phosphate; its inhibiting activity was 1000 times that of salicylate. Uridine-5'-diphospho-*N*-acetylglucosamine reduced the salicylate inhibition of the enzymic reaction and protected the enzyme from salicylate-induced irreversible inactivation. At a fixed concentration of uridine-5'-diphospho-*N*-acetylglucosamine (7×10^{-6} M), increasing concentrations of salicylate produced an increase in enzyme activity as compared with the control. Fructose-6-phosphate at 10^{-2} M also protected the enzyme against inactivation by 40 mM salicylate, while glutamine offered no such protection. The data suggest that sodium salicylate and uridine-5'-diphospho-*N*-acetylglucosamine apparently bind to the same site on the enzyme.

6750 ELECTROPHYSIOLOGICAL EFFECTS OF BURIMAMIDE AND 16,16-DIMETHYL PROSTAGLANDIN E_2 ON THE CANINE GASTRIC MUCOSA.

(E.) Bowen, J. C.; Kuo, Y. J.; Pawlik, W.; Williams, D.; Shanbour, L. L.; Jacobson, E. D. (Univ. Texas Medical Sch., 6400 W. Cullen, Houston 77025). *Gastroenterology* 68(6):1480-1484, 1975.

The electrophysiological effects of two potent inhibitors of gastric acid secretion, burimamide and 16,16-dimethyl prostaglandin E_2 (dm-PGE$_2$), were determined in an *in vivo* histamine-stimulated canine stomach preparation and an *in vitro* canine gastric mucosal preparation. In the *in vivo* preparations, a flap of stomach from the oxyntic gland area was secured within a partitioned chamber bathed with isotonic saline. Submaximal acid secretion was produced by i.v. histamine infusion (1.5 μg/kg-min). The transmural potential difference (PD) across the stomach preparation was determined before and after i.v. injection of a burimamide bolus (8.28 mg) or i.v. infusion of dm-PGE$_2$ (0.005 μg/kg-min for 1 hr). In the *in vitro* preparations, paired segments of gastric mucosa were mounted in identical flux chambers. Unidirectional fluxes of labeled sodium and chloride were determined before and after the addition of burimamide (3×10^{-4}M) or dm-PGE$_2$ (0.02 or 0.2 μg/ml) to the bathing solution on the serosal surface. In the *in vivo* preparation, burimamide caused a decrease in acid secretion, an increase in PD, and no significant change in the relative resistance (R). Dm-PGE$_2$ also inhibited acid secretion and increased the PD, but it also increased R. In the *in vitro* preparation, the unidirection flux of sodium from mucosa to serosa increased after dm-PGE$_2$ but not after burimamide. The passive sodium fluxes and unidirectional chloride fluxes were not altered after either agent. The data suggest that increased active transport of sodium from mucosa to serosa is at least partially responsible for the observed increase in transmural PD after dm-PGE$_2$, an agent which also decreases H$^+$ transport. With burimamide, the increased PD was due primarily to the inhibition of H$^+$ secretion.

6751 EFFECT OF CALCITONIN ON SERUM GASTRIN CONCENTRATION AND COMPONENT PATTERN IN MAN.

(E.) Frahrenkrug, J.; Hornum, I.; Rehfeld, J. F. (Bispebjerg Hosp., Copenhagen, Denmark). *J. Clin. Endocrinol. Metab.* 41(1):149-152, 1975.

The effects of synthetic salmon calcitonin on serum concentrations and distribution of the four main forms of gastrin and on serum concentrations of total and ultrafiltrable calcium were studied in nine normal subjects and three patients with pernicious anemia. In the normal subjects, the mean basal serum gastrin concentration was 26 pM/liter, as measured radioimmunochemically. Administration of calcitonin (0.7 Medical Research Council U/kg, i.v.) resulted in a significant decrease in serum gastrin levels measured at 20, 45, 60, and 90 min postinjection. Calcitonin given at the beginning of a protein-rich meal lowered the gastrin response significantly at 5-30 min after injection. In the three patients with pernicious anemia, serum gastrin concentrations were 1286 pM/liter before and 628 pM/liter after calcitonin injection. Sephadex gel filtration of sera from the three patients revealed that while calcitonin lowered the concentrations of all four main gastrin components, the decrease was most pronounced for the small components III and IV (gastrin-17 and gastrin-13). Calcitonin produced no significant changes in serum calcium concentrations or in unfilterable calcium concentrations calculated from calcium and albumin concentrations. No side effects were noted. The data suggest that calcitonin acts directly on the gastrin cells in the gastric antrum and duodenum.

6752 EFFECT OF CARBACHOLINE AND URECHOLINE ON PENTAGASTRIN-STIMULATED GASTRIC SECRETION IN HEALTHY SUBJECTS.

(E.) Roland, M.; Berstad, A.; Liavag, I. (Aker Univ. Hosp., Oslo 5, Norway). *Scand. J. Gastroenterol.* 10(4):357-362, 1975.

The effect of two cholinomimetics, carbacholine and urecholine, on the gastric mucosa were studied. Pentagastrin (0.15, 1.5 and 15 μg/kg/hr) either alone or in combination with carbocholine (2 μg/kg/hr) or urecholine (60 μg/kg/hr) was administered i.v. in each of six healthy subjects. Tests were performed in random order on different days. Each of eight 15-min samples (one basal and seven postinfusion) was analyzed for volume, pH, H$^+$, and pepsin. After pentagastrin alone there was a significant increase in acid output with 0.15 to 1.5 μg/kg/hr, but no further increase with 15 μg/kg/hr. At all pentagastrin doses, acid output was higher after pentagastrin plus urecholine than after pentagastrin plus carbacholine, but the differences were not significant. With 0.15 μg/kg/hr pentagastrin alone, pepsin output was lower than with both of the combined infusions, but only the difference between pentagastrin plus urecholine and pentagastrin alone was significant. After pentagastrin alone there was a significant increase in gastric juice volume from the lowest to the middle dose and a slight inhibition after the third dose. When carbacholine or urecholine was added to pentagastrin, the volume of gastric juice increased significantly from the lowest to the highest dose. At all dose steps of pentagastrin, the volume of gastric juice was higher after infusion of urecholine than of carbacholine, and at the two lowest doses the differences were significant. The volume of gastric juice was also higher after pentagastrin plus urecholine than after pentagastrin alone, and the differences were significant at the lowest and the highest doses. It is suggested that the cholinimimetics increased the sensitivity of the parietal cells to pentagastrin stimulation.

6753 EFFECTS OF CYCLIC ADENOSINE 3':5'-MONOPHOSPHATE AND RELATED AGENTS ON ACID SECRETION BY ISOLATED RABBIT GASTRIC MUCOSA.

(E.) Fromm, D.; Schwartz, J. H.; Quijano, R. (Harvard Medical Sch., Boston, Mass.). *Gastroenterology* 69(2):453-462, 1975.

The effects of various adenosine phosphate compounds, theophylline, histamine, and metiamide on steady states of acid secretion by isolated New Zealand rabbit fundic mucosa were studied. The tissue was mounted on a Lucite half-chamber and perfused with Ringer's solution. Steady-state rates of luminal acid secretion were measured by the pH stat method and the transmural electrical potential difference (PD) and short-circuit current (Isc) were also measured. The steady acid secretory and PD responses to dibutyryl AMP (DB-AMP), cyclic AMP, 2':3'-AMP, 5'-AMP, ATP, histamine, theophylline, and/or metiamide added to the serosal bathing solution were then determined. Cyclic AMP (5 mM or greater), DB-AMP (more than 0.45 mM), histamine (0.05 mM or greater) and theophylline (greater than 3 mM) increased the rate of acid secretion, and the addition of theophylline in a concentration which had no stimulatory effect (less than 3 mM) reduced the effective concentrations of cyclic AMP or histamine required for stimulation of acid secretion. Measurements of lactate, pyruvate, and CO$_2$ indicated that the increases in acid secretory rats were predominantly due to H$^+$ and not to the accumulation of organic acid in the luminal bathing solution. ATP (0.75 mM) and 5'-AMP (4 mM), but not 2':3'-AMP (10 mM), also stimulated acid secretion. Metiamide (3 mM) prevented the stimulatory effects of histamine and ATP, but it did not prevent the stimulatory effects of DB-AMP, theophylline, or 5'-AMP. The data suggest that cyclic AMP is involved in the regulation of acid secretion by the rabbit stomach and are consistent with the hypothesis that histamine and ATP require adenylate cyclase activity for stimulation of acid secretion and 5'-AMP inhibiting phosphodiesterase activity.

6754 EFFECTS OF DRUGS INFLUENCING GASTRIC SECRETION ON THE QUANTITATIVE HISTOLOGICAL DISTRIBUTION OF CYCLIC ADENOSINE 3':5'-MONOPHOSPHATE IN THE RAT STOMACH.

(E.) Katsumata, Y.; Glick, D. (Stanford Res. Inst., Menlo Park, Calif.). *Gastroenterology* 69(2):409-415, 1975.

Studies were undertaken to clarify the role of cyclic AMP in acid secretion in the rat stomach and to quantitate the effects of gastric stimulatory and inhibitory drugs on the cyclic AMP concentrations within the glandular stomach. Sixty min before sacrifice, fasted (24 hr) male Sprague-Dawley rats were injected s.c. with the secretion-stimulating drugs pentagastrin (250 μg/kg), urecholine (100 μg/kg), or histamine (2 or 40 mg/kg), or with the inhibitors atropine sulfate (2 mg/kg) or prostaglandin E$_2$ (PGE$_2$, 1 mg/kg). In some experiments, these drugs were combined with theophylline (200 mg/kg, i.p., 15 min before sacrifice), a drug that prevents enzymatic degradation of cyclic AMP. Controls received s.c. or i.p. injections of 0.9% NaCl, the solution in which the test compounds were administered. Cyclic AMP concentrations in circular fresh-frozen microtome sections, representing the various histologic regions of the glandular stomach, were measured by the firefly luminescence method. The peak cyclic AMP concentrations in the NaCl-injected controls were found in the parietal-mucous neck cell region (3.3 pM/mg wet weight; 0.11 pM/μg protein-nitrogen). Pentagastrin and urecholine alone increased the peak values slightly (both about 4 pM/mg wet weight; 0.15 pM/μg protein-nitrogen). Theophylline alone had a slightly greater effect (5.4, 0.22), but theophylline given with pentagastrin or urecholine greatly elevated the values (8.3, 0.31). In addition, urecholine or pentagastrin plus theophylline generated two approximately equal cyclic AMP concentration peaks (about one-half the parietal-mucous neck cell peak value) in the chief cell and muscle regions. Histamine at 40 mg/kg slightly suppressed the parietal-mucous neck cell concentrations (2.7, 0.11), but at 2 mg/kg, it elevated these values significantly; histamine (2 mg/kg) plus theophylline had an even greater effect (9.1, 0.32). The other histological regions were not significantly influenced by histamine. Neither atropine nor PGE$_2$, alone or in combination with theophylline, had much influence on the parietal-mucous neck cell cyclic AMP levels; but both caused significant increases in the chief cell and muscle levels. The data indicate a cyclic AMP involvement in the stimulation of acid secretion in the rat stomach.

6755 CYCLIC NUCLEOTIDE REGULATION OF GASTRIC ACID SECRETION.

(E.) Charters, A. C.; Chandler, J. G.; Flamant, Y. M.; Faulkner, M. A.; Orloff, M. J. (Univ. California, San Diego Sch. Medicine, La Jolla). *Surg. Forum* 24:361-363, 1973.

Intracellular cyclic AMP concentrations and adenyl cyclase and phosphodiesterase activities were measured in the frog isolated gastric mucosa in the basal state and during pentagastrin-stimulated acid secretion. The gastric mucosa from *Rana pipiens* were mounted on plastic syringe barrels and immersed in a nutrient serosal solution; unbuffered mucosal solution was added to the syringe barrel. Acid secretion was measured before and after the addition of pentagastrin (10^{-6} M) to the serosal solution. Cyclic AMP levels were examined at the midportion of the secretory response curve for pentagastrin, and adenyl cyclase and phosphodiesterase activities were estimated from the cyclic AMP levels. Pentagastrin elicited a mean 74% increase over basal acid secretion. In the stimulated, but not the control, mucosa, the intracellular cyclic AMP concentration correlated significantly with the acid secretory response. Adenyl cyclase activity and the cyclic AMP concentration were significantly related in both the unstimulated and control mucosa; phosphodiesterase activity did not correlate with cyclic AMP levels and there was no apparent relation between acid secretion and phosphodiesterase activity. The data support the hypothesis that the adenyl cyclase-cyclic AMP system is the intracellular mediator of pentagastrin-stimulated acid secretion.

6756 CYCLIC GMP IN STIMULATED GASTRIC MUCOSA.

(E.) Eichhorn, J. H.; Salzman, E. W.; Silen, W. (Harvard Medical Sch., Boston, Mass.). *Surg. Forum* 24:363-365, 1973.

The effects of cholinergic stimuli on the gastric mucosal levels of cyclic guanosine 3'5'-monophosphate (cGMP) were studied using strips of fundic gastric mucosa from adult mongrel dogs. Prior to removal of the mucosal strips, the dogs were subjected to: electrical stimulation of the distal transected vagus trunks above the diaphragm; infusion of acetylcholine (ACh, 0.05 mg/min) into the celiac artery; pretreatment with atropine (1.0 mg/5 kg) before electrical stimulation of the vagi; or i.v. pentagastrin infusion (10 μg/kg/hr). The mucosal strips were acid extracted and fractionated on a formate ion-exchange resin column. The cGMP-containing fraction was assayed by a double radioimmune method. Electrical stimulation of the vagus nerves produced a marked increase in the cGMP content of the fundic mucosa, an effect which was blocked by pretreatment with atropine. ACh infusion also produced significant increases in the cGMP concentration, but pentagastrin had no such effect. The data demonstrate an *in vivo* association between cholinergic stimuli and an increase in gastric mucosal cGMP. Combined with previous results, they suggest that cGMP may serve as a mediator of cholinergic stimuli, analogous to the postulated "second messenger" role of cAMP for adrenergic stimuli.

6757 EFFECT OF DIAZEPAM ON UNSTIMULATED AND ON STIMULATED GASTRIC SECRETION.

(E.) Bennett, P. N.; Davies, P.; Frigo, G. M.; Weerasinghe, M. T.; Lennard-Jones, J. E. (Univ. Coll. Hosp., London, England). *Gut* 15(11):101-103, 1974.

The effect of i.v. diazepam on unstimulated and pentagastrin-stimulated gastric secretion was studied in 12 normal male and female subjects. Gastric secretion was collected by suction pump through a nasogastric tube placed in the fasted subjects. Pentagastrin (6 μg/kg/hr) was infused for 2.25 hr. Serial collections of gastric juice were made at 15-min intervals in the unstimulated and pentagastrin-stimulated subjects, then were repeated in both groups during the i.v. administration of diazepam (0.14 mg/kg). The volume of secretion was reduced in all six unstimulated subjects following diazepam, and in five subjects the acid content was reduced. However, diazepam had no significant effect on the volume of secretion or acid content in the pentagastrin-stimulated subjects. The results indicate that diazepam may reduce nonstimulated gastric secretion by a centrally mediated action; this effect may be of advantage in peptic ulcer therapy.

6758 RELEASE OF IMMUNOREACTIVE GASTRIC INHIBITORY POLYPEPTIDE (IR-GIP) BY ORAL INGESTION OF FOOD SUBSTANCES.

(E.) Cleator, I. G. M.; Gourlay, R. H. (Dept. Surgery Physiology, Univ. British Columbia, Vancouver, B. C., Canada). *Am. J. Surg.* 130(2):128-135, 1975.

The purpose of this study was to examine the pattern of immunoreactive gastric inhibitory polypeptide (IR-GIP) release in man after oral ingestion of various food substances in an attempt to find a specific releaser of IR-GIP for use in further studies of the role of GIP in physiologic and pathologic conditions. All studies were performed in adult subjects after an overnight fast. The subjects had no history of gastrointestinal diseases and no family history of diabetes, and they were within 10% of ideal body weight. Each study was carried out in at least six subjects, except an i.v. porcine GIP infusion study, in which three subjects had two tests each. The mean fasting IR-GIP level in 107 normal subjects was 410 ± 23 pg/ml. Lipomul (an oleic acid suspension), glucose (Pal-a-dex 100), galactose, and leucine, all given p.o., significantly elevated the serum IR-GIP level in man. Inhibition of acid and pepsin secretion (enterogastrone effect) was demonstrated after elevation of serum IR-GIP levels by introduodenal administration of Lipomul and by i.v. infusion of porcine IR-GIP. Increases in serum IR-GIP levels induced by p.o. glucose or i.v. porcine GIP were associated with increases in serum immunoreactive insulin levels. I.v. glucose had no effect on the serum IR-GIP level but produced an increase in the immunoreactive insulin level. Concurrent administration of Lipomul and i.v. glucose induced a significant decrease in the serum IR-GIP level. It is postulated that GIP releases insulin and that insulin, in turn, inhibits GIP release.

6759 THE INTESTINAL PHASE OF GASTRIC SECRETION: A PHARMACOLOGICAL PROFILE OF ENTERO-OXYNTIN.

(E.) Way, L. W.; Cairns, D. W.; Deveney, C. W. (Dept. Surgery, Univ. California, San Francisco 94121). *Surgery* 77(6):841-850, 1975.

The pharmacologic properties of entero-oxyntin, the hormone responsible for the intestinal phase of gastric secretion, were studied in male and female mongrel dogs prepared with antrectomies, gastrojejunostomies, and Heidenhain pouches. A Gregory cannula was placed in the Heidenhain pouch and a Thomas cannula was placed in the gastric remnant as a gastric fistula. The dogs were fed a meal of cooked liver with 5% bone meal and the gastric acid was collected in continuous 15-min samples. In subsequent experiments, the dogs were given i.v. histamine dihydrochloride (0.10 mg/kg/hr for 3.5 hr), i.v. pentagastrin (8 μg/kg/hr for 3.25 hr), the octapeptide of cholecystokinin (OP-CCK, 400 ng/kg/hr for 2.5 hr i.v.), i.v. cholecystokinin (4 U/kg/hr for 1 hr), s.c. bethanecol (0.1 mg/kg/hr for 3 hr), i.v. secretin (2 U/kg/hr for 1 hr), i.v. atropine (0.06 mg/kg bolus), and i.v. metiamide (3 μM/kg bolus) during the period of maximal feeding-stimulated acid secretion. Acid secretion from the Heidenhain pouch was stimulated by feeding with no increase in the serum gastrin concentrations. Simultaneous administration of pentagastrin, histamine, OP-CCK, or bethanecol potentiated the acid secretion, while atropine and metiamide inhibited secretion; secretin and glucagon were without significant effect. The results suggest that entero-oxyntin differs from antral gastrin, histamine, and cholecystokinin-pancreozymin, and that it activates a separate set of receptors on the parietal cells. Secretagogue potentiation may normally be important in determining the acid secretory response to a meal.

6760 DOSE-RESPONSE RELATIONSHIP OF GRADED DOSES OF INTRAVENOUS HISTAMINE INFUSION ON GASTRIC ACID SECRETION IN MAN.

(E.) Naik, S. R.; Bajaj, S. C.; Goyal, R. K.; Chuttani, H. K. (Maulana Azad Medical Coll., New Delhi, India). *Digestion* 11(5-6):321-332, 1974.

The dose-response relation between i.v. histamine and gastric acid output was studied in nine healthy male adults of North Indian origin. The stomach contents were removed by nasogastric tube from the fasted subjects. Basal secretion was then measured and 50 mg of mepyramine maleate was administered i.m. Histamine (20-100 μg/kg/hr) was administered as histamine acid phosphate *via* constant i.v. infusion. Gastric secretions were collected every 15 min for three hr, and the acid content determined by titration with 1 N NaOH. Following i.v. histamine, the acid output gradually increased during the first 60 min and a steady state of acid secretion was reached for all dose levels during the second hr. Acid output increased significantly with increasing doses of histamine up to 80 μg/kg/hr; although acid output with 100 μg/kg/hr was greater than with 80 μg/kg/hr, this difference was not significant. Estimations of Vmax and the dose of histamine producing a response equal to 50% of the Vmax (K_m) by three different transformations of the Michaelis-Menten equation gave somewhat different values for these constants, and all values differed slightly from those estimated directly with curvilinear regression. The plot used by Hirschowitz gave the best results: V_{max} = 44.07 mEq/hr; K_m = 34.46 μg/kg/hr. Data analysis using dose of histamine independent of body weight gave a poorer fit to the regression line than the data obtained using histamine dose on the basis of body weight, suggesting that dosage should be determined on the basis of body weight. The value of K_m in the Indian subjects was almost six times the value obtained in Western subjects, indicating the relative insensitivity of the parietal cells of the former to histamine.

6761 EFFECT OF HYDROCORTISONE ON GASTRIC SECRETION AND SERUM GASTRIN IN DOGS.

(E.) Watson, L. C.; Reeder, D. D.; Thompson, J. C. (Univ. Texas Medical Branch, Galveston). *Surg. Forum* 24:354-356, 1973.

The effects of acute and chronic hydrocortisone treatment on the serum gastrin response to a standard meal and the acid secretion from a denervated pouch were studied in adult dogs. In the acute studies, the antrum was isolated and hydrocortisone acetate (50, 100, or 200 mg) was injected at 45-min intervals. The gastrin concentration in the venous blood was determined by radioimmunoassay. In the chronic studies, dogs with Heidenhain pouches were given a standard 500-g meat meal and the gastric secretions and serum gastrin concentrations were determined at 30-min intervals for three hr. Hydrocortisone was then injected i.m. at 100 mg/day for five days and the effects of food on acid secretion and serum gastrin levels were redetermined. Hydrocortisone produced no significant changes in serum gastrin levels (basal level 72 pg/ml) in the acute study. In the chronic study, the mean basal serum gastrin level was 98 pg/ml; after 5 days of hydrocortisone treatment, this rose significantly to 121 pg/ml. The three-hr integrated serum gastrin output after food was 10.2 ng/min/ml, which rose significantly to 16.1 ng/min/ml after five days of hydrocortisone treatment. The acid output after food was also significantly elevated after hydrocortisone. These findings provide information on the pathogenesis of steroid-induced ulcerations.

6762 EFFECTS OF 13-Nle-MOTILIN IN MAN — INHIBITION OF GASTRIC EVACUATION AND STIMULATION OF PEPSIN SECRETION.

(E.) Ruppin, H.; Domschke, S.; Domschke, W.; Wunsch, E.; Jaeger, E.; Demling, L. (Dept. Med., Univ. Erlangen-Nurnberg, Erlangen, West Germany). *Gut* 16(1):199-202, 1975.

The effects of i.v. 13-norleucine-motilin (13-nle-motilin) on gastric emptying and pepsin secretion were studied in three healthy men. Gastric fasting contents were removed from the fasted subjects by a gastric tube placed with its tip in the upper antrum. The stomach was then rinsed and 300 ml of test solution (10% mannitol in 0.5 M citric acid-phosphate buffer, pH 3.0) was instilled intragastrically. Polyethylene-^{14}C glycol served as a nonabsorbable marker. 13-Nle-motilin was administered on alternate days by continuous i.v. infusion in dosages of 0.1, 0.2, and 0.4 μg/kg-hr. The gastric contents were mixed by withdrawal and reinstillation. Gastric volumes, radioactivity of 15-min gastric samples, and pepsin activity in the samples were determined. Gastric emptying was slowed in a dose-dependent fashion by increasing doses of 13-nle-motilin. This was indicated by increasing 'half-lives' and 'starting indices' of the gastric emptying process, and by decreasing pyloric loss rates, respectively. The gastric pepsin output rose markedly from the basal level during i.v. 13-nle-motilin infusion. These results, in conjunction with previous data, suggest different susceptibilities of gastric and duodenal muscles to 13-nle-motilin. They also suggest that a common receptor site for secretin and motilin may be present in the stomach.

6763 THE COMBINED EFFECT OF PENTAGASTRIN AND MAGNESIUM ON GASTRIC ACID SECRETION IN MAN.

(E.) Christiansen, J. (Bispebjerg Hospital, Copenhagen, Denmark). *Gut* 16(1):203-205, 1975.

To determine the mechanism by which magnesium acts on gastric acid secretion, the combined effects of pentagastrin and magnesium on gastric acid secretion were studied in 10 healthy male and female volunteers. The gastric secretion was collected *via* a Levin tube in the fasted subjects, after which pentagastrin (0.5 μg/kg/hr) was administered over a three-hr period by constant i.v. infusion. After two hr of pentagastric infusion, when a secretory plateau had been obtained, magnesium sulfate (0.4 mEq Mg^{++}/kg/hr) was infused for one hr. The volume of the secretion collected for each 15-min period and the concentrations of H^+ and ^{51}Cr-labeled edetic acid were determined. Blood samples were also taken every 15 min for magnesium determination and at 0, 120, and 210 min for calcium determination. Pentagastrin infusion resulted in a secretory plateau which was unaltered during magnesium infusion; this applied to volume secretion as well as to acidity and acid output. Serum magnesium was elevated during magnesium infusion, but serum calcium concentration was unchanged throughout the experiment. The data could be explained by a dose-dependent relation between gastrin, magnesium, and calcium on acid secretion.

6764 EFFECT OF GASTRIC SECRETORY INHIBITORS ON THE GASTRIC MUCOSAL BARRIER.

(E.) O'Brien, P. E.; Carter, D. C. (Royal Infirm., Edinburgh, Scotland). *Gut* 16(6):437-442, 1975.

The effects of the synthetic prostaglandin 16, 16-dimethyl-E_2 methyl ester (16-diMe-PGE_2) and the histamine H_2-receptor antagonist, metiamide on the gastric mucosal barrier were studied in male dogs prepared with antrectomies and Heidenhain pouches. At the start of each of six 30-min experimental periods, basal solution or a test solution was instilled into the pouches of the fasted dogs. The fluid was sampled at the beginning and end of each period and assayed for Na^+ and H^+ concentrations. The basal solution consisted of 80 mEq/liter of HCl made isotonic with NaCl. The test solutions consisted of: basal solution with 20 mM sodium taurocholate replacing an equal amount of NaCl; and basal or taurocholate solution containing 30 μg/20 ml of 16-diMe-PGE_2 or 220 mg/20 ml of metiamide. In some experiments, the basal or taurocholate solution was instilled into the pouch and 16-diMe-PGE_2 (7.5 or 30 μg) or metiamide (75 mg) was given by i.v. injection. A low and stable ionic flux across the gastric mucosal barrier occurred in the basal state, a marked and highly significant increase in both H^+ back diffusion and Na^+ output being observed with the addition of taurocholate to the basal solution. When instilled into the Heidenhain pouch, 16-diMe-PGE_2 caused a marked increase in the rate of Na^+ output and a moderate increase in the rate of H^+ back diffusion from the pouch; both changes were highly significant. Bleeding from the pouch after administration of 16-diMe-PGE_2 occurred in four of six experiments. I.v. 16-diMe-PGE_2 did not alter the mucosal barrier or the response of the mucosa to sodium taurocholate. Metiamide did not affect the mucosal barrier or the response to taurocholate when given i.v. or instilled into the pouch. It is likely that the damaging effect of intragastric 16-diMe-PGE_2 reflects a specific biological action rather than the nonspecific chemical effect of a fatty acid. It is unlikely that histamine H_2 receptors play a significant role in the ionic fluxes observed after gastric mucosal barrier damage.

6765 SECRETIN EFFECT ON GASTRIN, GASTRIC SECRETION IN DOGS WITH CHRONIC ANTRAL STIMULATION.

(E.) Nasca, S.; Mignon, M.; Gramatica, L.; Accary, J. P.; Bonfils, S. (Unite Recherches Gastroenterologie, Institut National Sante, 75877 Paris Cedex 18, France). *Am. J. Physiol.* 228(6):1775-1781, 1975.

The effects of exogenous secretin on plasma gastrin levels and acid secretion were studied in dogs under conditions of chronic antral gastrin hyperproduction; the pepsigogue effect of secretin at various levels of secretin-induced acid suppression was also studied. Adult beagles were prepared with a Heidenhain pouch and an antral transposition onto the colon; gastrointestinal continuity was restored by an end-to-side gastrojejunostomy. Antrocolic transposition resulted in a marked increase in fasting plasma gastrin concentration and sustained high levels of acid secretion, acid output and plasma gastrin being significantly correlated in the fasting state. A marked increase in pepsin production accompanied the acid hypersecretion, but the pepsin output was not correlated with the plasma gastrin levels. Infusion 0.5, 1, and 2 U/kg/hr of secretin induced a dose-related depression in acid secretion and plasma gastrin; the reduction in acid output was two-fold greater than that in plasma gastrin and was related to reductions in both acid concentration and secretory volume. The fasting acid output correlated significantly with the remaining acid output during secretin infusion and with the maximal reduction in acid output after secretin. Despite the reduction in the secretory volume of the pouch after secretin, secretin at 0.5 and 1 U/kg/hr produced a 1.5- and 2-fold increase in pepsin output, resp. Secretin at 2 U/kg/hr decreased both the secretory volume and pepsin output. If the physiological release of secretin in dogs does not exceed the equivalent of the lowest dose studied, these results indicate that acid inhibition is a physiological action of secretin; the effect on the circulating gastrin concentration appears to be pharmacological.

6766 GASTRIC ACID RESPONSE TO ANTRUM DISTENSION IN MAN. *(E.)*

Bergegardh, S.; Olbe, L. (Kir. klin. II, Sahlgrenska sjukhuset, S-413 45 Goteborg, Sweden). *Gut* 16(1):171-176, 1975.

Gastric acid secretion in response to graded distension of the antrum was studied in six healthy subjects (four men), seven men with quiescent duodenal ulcers, 14 patients (12 men) with active duodenal ulcers, and five patients (two men) with gastric ulcers. A double lumen nasogastric tube was placed in the fasted subjects with its tip in the oral portion of the antrum. The antrum was distended by a balloon attached to the tip of the nasogastric tube and filled with increasing volumes of water (50, 100 and 150 ml) mixed with contrast medium. The stomach was continuously perfused with a phenol red solution. The volume and pH of the collected gastric contents were determined every 15 min, as was the amount of acid recovered and the phenol red concentration in the gastric contents. To determine the acid response to exogenous gastrin, pentagastrin was infused i.v. at 90 μg/hr for 45 min followed by 300 μg/hr for a further 45 min. In the healthy subjects, the mean basal acid secretion was 1.6 mEq/15 min, the mean peak acid output following pentagastrin was 9.1 mEq/15 min, and antrum distension did not significantly increase gastric acid secretion. In the quiescent duodenal ulcer patients, the mean basal acid secretion was 1.9 mEq/15 min, the mean peak acid output in response to pentagastrin was 12.0 mEq/15 min, and antrum distension did not significantly increase gastric secretion. In the active duodenal ulcer patients, the mean basal acid secretion was 2.3 mEq/15 min, the mean peak acid output following pentagastrin was 12.4 mEq/15 min, and antrum distension significantly increased gastric acid secretion. In the gastric ulcer patients, the mean basal acid secretion was 0.1 mEq/15 min, the mean peak acid output in response to pentagastrin was 5.1 mEq/15 min, and antrum distension resulted in a slight, but rarely significant, increase in gastric acid secretion. The pH of the gastric contents ranged from 1.8 in patients with active duodenal ulcers to 3.0 in those with gastric ulcers; the mean phenol red recovery ranged from 87% in normal subjects to 95% in gastric ulcer patients. The results indicate that the acid secretory effect of mechanical stimulation of the antrum is qualitatively different in healthy subjects and ulcer patients, with a marked acid response in patients with an active duodenal ulcer.

6767 INFLUENCE OF ANTRECTOMY ON GASTRIN RELEASE AND GASTRIC SECRETION IN CONSCIOUS MONKEYS.

(E.) Rosato, E. F.; Shumate, G. R.; Pollock, T. W.; Adair, L.; Rosato, F. E.; Brooks, F. P. (Philadelphia Veterans Admin. Hosp., Pa. 19104). *Surgery* 77(6): 817-824, 1975.

The plasma gastrin response to feeding and insulin stimulation was determined before and after precise antrectomy in conscious male rhesus monkeys (*Macaca mulatta*). The animals were prepared with gastric fistulas with modified Thomas cannulas. Chlorpheniramine maleate (10 mg) was injected s.c. 15 min before each experiment and histamine acid phosphate (0.02, 0.04, 0.08 mg/kg/hr) in saline was infused i.v. at a constant rate of 30 ml/hr. In the feeding stimulation trials, the animals were given a 30-min standard meal and the plasma gastrin levels were determined in the basal period and 10-180 min after feeding. In the insulin stimulation trials, gastric acid output and plasma gastrin were determined before and for eight 15-min periods after the i.v. injection of aqueous insulin (1-1.5 U/kg). Feeding resulted in a significant increase in plasma gastrin levels from basal levels of 107 pg/ml to 276 pg/ml. Stimulation with insulin increased the plasma gastrin levels to 182 pg/ml from a basal level of 93 pg/ml. Antrectomy reduced the basal gastrin concentrations and abolished the gastrin response to both feeding and insulin. It also abolished the acid secretory response to histamine and insulin. When three monkeys were antrectomized and maintained by duodenal feeding, the histamine acid secretory response was virtually abolished within 24 hr and did not recover within a four week period. In two animals, the addition of a submaximal dose of pentagastrin did not alter the response to histamine stimulation. Parietal cell architecture remained intact. The data indicate that the loss of secretory capacity secondary to antrectomy is due to the loss of circulating antral gastrin. The onset is prompt, is not related to reflux gastritis or parietal cell atrophy, and is not corrected by the administration of pentagastrin. The mechanism of this reaction is unknown.

6768 HEIDENHAIN POUCH DISTENSION AS A STIMULUS FOR ACID AND PEPSIN SECRETION. *(E.)*

Magee, D. F.; Hu, C. (Creighton Univ. Sch. Medicine, 2500 Calif. St., Omaha, Neb. 68178). *Ann. Surg.* 182(2):121-123, 1975.

The effects of Heidenhain pouch distension on the secretion of acid and pepsin were studied in six dogs with long-standing Heidenhain pouches and simple gastric fistulas. The pouches were distended with saline (30, 60 and 90 ml), the mean pressures within the pouch being elevated to 16.8, 21.0, and 22.5 cm of H_2O, resp. Beginning 30 min before the first distension, pentagastrin was given by continuous i.v. infusion (0.5 μg/min). Atropine sulfate (1 mg, i.v.) and pentolinium tartrate (1 mg/kg, i.m.) were given as single injections, and in some experiments a 0.5% solution of oxethazaine, a topical local anesthetic, was retained in the pouch for 10 min. There was a positive straight-line relation between the volume of saline added to the pouch and acid and pepsin secretion. I.v. pentagastrin did not alter the slope of the acid curve, but greatly increased the yield of acid at each level; pentagastrin had the opposite effect on pepsin secretion. Atropine significantly depressed the arithmetic regression lines for both acid and pepsin, but the calculated secretions at 0 distension were similar with and without atropine. Ganglionic blockade with pentolinium tartrate and oxethazaine rinse both depressed the acid response significantly, but neither had any effect on pepsin secretion. The data suggest that distension stimulates acid secretion from Heidenhain pouches *via* a cholinergic mechanism involving a local anesthetic-sensitive receptor and a synapse; the mechanism of distension-induced pepsin secretion appears to be different.

6769 INHIBITION OF GASTRIN-STIMULATED CANINE ACID SECRETION BY SHAM-FEEDING. *(E.)*

Sjodin, L. (Dep. Pharmacology, Karolinska Institutet, S-104 01 Stockholm, Sweden). *Gut* 15(11):73-80, 1974.

The inhibition of gastric secretion induced by sham feeding was characterized in five mongrel dogs with Heidenhain pouches and esophageal fistulas. Saline was continuously infused for one hr, after which pentagastrin (4 µg/kg/hr), histamine (100 µg/kg/hr), and/or bethanechol chloride (50 µg/kg/hr) was added to the infusion, which was continued for another four hr. After two hr of secretagogue administration, the dogs were sham fed for 10 or 60 min. The gastric juice was collected throughout the infusions *via* a cannula placed in the lower fundic portion of the main stomach. Pentagastrin-stimulated acid output from the vagally innervated main stomach increased significantly after 10 min of sham feeding, while acid secretion from the vagally denervated fundic pouches was depressed by an average of 33% after sham feeding. There was a corresponding reduction in the secretory volume. In the presence of histamine stimulation, sham feeding did not significantly affect the Heidenhain pouch secretion. When secretion was stimulated with a combination of pentagastrin and bethanechol chloride, the inhibitory effect of sham feeding was less pronounced than with pentagastrin alone. After these initial experiments, extra-gastric abdominal vagotomies were performed on four dogs and truncal vagotomies on three. The Heidenhain pouch acid responses to gastrin were decreased in most dogs after selective extra-gastric vagotomy, whereas the inhibitory effect of sham feeding was reduced or abolished by truncal vagotomy. The results are consistent with the hypothesis that vagal activity releases a hormone which has an inhibitory action on gastric acid secretion.

6770 STAGES IN THE RECOVERY OF FEEDING FOLLOWING VAGOTOMY IN RABBITS. *(E.)*

Rezek, M.; Vanderweele, D. A.; Novin, D. (Dept. Psychology, Univ. California, Los Angeles). *Behav. Biol.* 14(1):75-84, 1975.

The effects of vagotomy on the spontaneous intake of liquid and solid food was studied in 27 adult female rabbits. The animals were either chronically vagotomized or laparotomized (controls) and maintained on a free-feeding regimen. In the first experiment, the rabbits received duodenal cannulas and were fed a choice of greens, liquid, rabbit pellets during recovery from surgery. Food intake patterns were recorded before surgery and after the daily food intake had stabilized at 100 g or more per day. In the second experiment, the animals were treated as in the first experiment but did not receive duodenal cannulation and received solid and liquid food alternately, not simultaneously. Food intake patterns were recorded as soon as the animal began eating 800 g of solid food or 240 ml of liquid food per day, whether or not intake was stabilized. In the first experiment, the vagotomized animals took significantly longer to recover than the controls and mortality was 25% compared with 0% in the control group. After vagotomy, the animals were aphagic or severely hypophagic when offered only solid food, although they began to eat greens almost immediately. If greens were withdrawn, the animals again became aphagic or hypophagic, after which they spontaneously resumed liquid food intake; stable intake of solid food was not observed until several days later. Once recovered, the vagotomized rabbits showed a pattern of food intake characterized by significantly longer but less frequent meals than observed in the controls; the total daily food intake and feeding time were comparable in the two groups. The circadian pattern of alimentary behavior was largely unchanged after vagotomy. In the second experiment, the vagotomized rabbits showed a pattern of significantly more frequent and significantly smaller meals compared with controls and their own presurgery pattern. In both experiments, the animals shifted after several weeks to a pattern of longer, larger, and less frequent meals. The data indicate that the vagus nerve participates in meal patterning and appetite and that the effects of vagotomy change with time, probably as a result of reorganization of regulative controls. The data also indicate the importance of vagal afferent and efferent information in the control of eating.

6771 EFFECT OF INDUCED HYPERCALCEMIA ON GASTRIN RELEASE BY FOOD AND BY ANTRAL ALKALINIZATION IN MAN. *(E.)*

Basso, N.; Giri, S.; Fiocca, F.; Passaro, E., Jr.; Speranza, V. (Instituto Anatomia Chirurgica e Corso Operazioni, Univ. Roma, Italy). *Surg. Italy* 4(2):73-75, 1975.

The effects of induced hypercalcemia on gastrin release stimulated by food and antral alkalinization were studied in six healthy young men. Serum gastrin levels were determined under basal conditions and at 15-min intervals five hr following the ingestion of 150 cc of a saturated sodium bicarbonate solution (pH 7.5); after five days, this protocol was repeated with a three-hr Ca^{++} infusion (4 mg/kg/hr) preceding antral alkalinization and continuing throughout the experiment. In the second experiment, the fasted subjects were allowed to smell cooking food for 15 min and then were fed 250 ml of meat broth and 200 g of lean veal steak; five days later, this protocol was repeated during Ca^{++} administration as in the first experiment. After antral alkalinization, serum gastrin levels rose to 135% of basal values. The protein meal augmented the serum gastrin levels by 25% over basal values, while smelling cooking food decreased the gastrin levels to 85% of basal values. Calcium infusion alone increased basal gastrin levels by 25% during calcium infusion; antral alkalinization and the protein meal augmented basal gastrin levels by 110% and 120%, resp. Smelling cooking food also significantly increased serum gastrin levels in hypercalcemic subjects. The data suggest that calcium may be a mediator in all of the secretory mechanisms studied.

6772 EFFECTS OF NUTRITIONAL STATUS ON GASTRIC SECRETION AND COMPOSITION IN X-IRRADIATED RAT. *(E.)* D'Souza, D. W.; Vakil, U. K.; Sreenivasan, A. (Biochemistry Food Technology Div., Bhabha Atomic Res. Centre, Bombay, India). *Environ. Physiol. Biochem.* 4(6):270-279, 1974.

The effects of sublethal (400 r) and lethal (800 r) whole-body x-irradiation on the secretion and composition of gastric juice were studied in male Wistar rats maintained on diets with different protein levels (no protein, 8%, or 20%) with or without vitamin A supplementation (5000 IU retinyl palmitate/kg). Morphological changes in the stomachs of irradiated rats were also followed. In rats fed a nutritionally adequate diet, whole-body x-irradiation caused a progressive reduction in gastric acid secretion, with a maximum drop (50% in lethally irradiated rats) on the eighth day; free acidity and total acidity also decreased significantly. Specific peptic activity in gastric juice was 40% and 60% of control values in rats irradiated at 400 r and 800 r, resp.; pepsin and gastricsin activities also declined progressively up to the eight day post-irradiation. In sublethally irradiated rats, gastric juice secretion and proteolytic activities, resp., returned to normal levels on days 14 and 16 postirradiation; lethally irradiated rats did not survive beyond eight to 10 days. Radiation also resulted in a sudden rise (day one) in histamine levels in gastric juice, serum, and tissues, but values returned to normal by day three. While gross and severe degenerations were evident in the rat stomach two days postirradiation (400 r), stomach morphology was normal after eight days. Simultaneous deficiencies in protein and vitamin A had additive effects on gastric secretion and composition. Recovery from radiation injury dependend on the nutritional status of the animal. Protein-fasted animals did not survive beyond 14 days even when exposed to 400 r, and recovery was delayed at least six days in animals fed a low (8%) protein diet. The poor recovery in protein deficiency may be due to higher initial damage and subsequent increased sensitivity of tissues to x-irradiation.

6773 DEPRESSION OF ANTRAL AND SERUM GASTRIN CONCENTRATION BY FOOD DEPRIVATION IN THE RAT. *(E.)* Lichtenberger, L. M.; Lechago, J.; Johnson, L. R. (Veterans Admin. Wadsworth Hosp. Center, Wilshire and Sawtelle Blvd., Los Angeles, Calif. 90073). *Gastroenterology* 68(6):1473-1479, 1975.

The effects of food deprivation and refeeding on serum gastrin concentration and antral G-cell number were studied in male Wistar rats. In the first study, the rats were fed or fasted two, four or six days. In the second study, the rats were fasted for four days then refed for 30 min, three hr, 12 hr, one day, three days, six days, or nine days. In the third study, the rats were starved or fed (six days) powdered rat chow, a liquid diet, a high bulk nonnutritive diet, or a high bulk diet to which sucrose was added. At the completion of each study, serum and antral gastrin concentrations were determined by radioimmunoassay, and antral sections were examined by an indirect immunofluorescent antibody technique. A marked stepwise decrease in antral and serum gastrin levels was noted with increasing periods of starvation; by the fourth day, the antral gastrin decreased to one-third and the serum gastrin decreased to one-eighth of the fed levels. The number of antral cells reacting with fluorescent antigastrin antiserum was correspondingly decreased. After refeeding, the serum gastrin levels returned to normal levels within six days and the antral gastrin concentration and number of G-cells returned to normal within nine days. The rats fed the powdered rat chow or liquid diet for six days showed normal weight gain or maintenance and normal serum and antral gastrin levels. The fasted rats and those fed the high bulk nonnutritive diet lost weight to the same extent and showed similarly reduced antral and serum gastrin levels. Gastrin levels in the rats fed the sweetened high bulk diet were similar to those in the fasted rats. The data suggest that food in the gastrointestinal tract is necessary for the maintenance of normal serum and antral gastrin levels in rat. The effect of food is most likely attributable to its chemical constituents and not distention by bulk.

6774 GASTRIC INTRINSIC FACTOR SECRETION. *(E.)* Vatn, M. H. (Ulleval Hosp., Oslo, Norway). *Scand. J. Gastroenterol.* 10(4):337-338, 1975.

6775 THE ACTION OF SEROTONIN, LISURIDE AND RESERPINE UPON STOMACH EVACUATION IN RATS. *(Z.)* Visnovsky, P. (Fac. Med., Charles Univ., Martin, Czechoslovakia). *Cesk. Gastroenterol. Vyz.* 29(1):18-23, 1975.

6776 THE EFFECT OF GASTRIC ACID SECRETION OF DIFFERENT CHAIN LENGTHS OF FATTY ACIDS IN THE DUODENUM. *(E.)* Deveney, K. E.; Way. L. W. (Dep. Surg., Univ. California, San Francisco, Calif.). *Gastroenterology* 68(4):1009, 1975.

6777 EFFECT OF GIP AND VIP ON GASTRIN RELEASE AND GASTRIC SECRETION. *(E.)* Villar, H. V.; Rayford, P. L.; Reeder, D. D.; Thompson, J. C. (Univ. Texas Med. Branch, Galveston, Tex.). *Gastroenterology* 68(14):1006, 1975.

6778 CELL PROLIFERATION AND MIGRATION IN DEVELOPING GASTRIC MUCOSA. *(E.)* Yeomans, N. D.; Trier, J. S. (Peter Bent Brigham Hosp., Boston, Mass.). *Gastroenterology* 68(4):1002, 1975.

6779 REGULATION OF RAT GASTRIC MUCOSAL GUANYL CYCLASE ACTIVITY (GC). *(E.)* Thompson, M. J.; Jacobson, E. D. (Univ. Texas Med. Sch., Houston, Texas). *Gastroenterology* 68(4):998, 1975.

6780 VISIBLE AND ELECTROPHYSIOLOGICAL EFFECTS OF ETHANOL ON GASTRIC MUCOSA: A TIME STUDY UNDER RESTING, ACID AND SECRETING CONDITIONS. *(E.)* Tague, L. L.; Shanbour, L. L. (Univ. Texas Med. Sch., Houston, Tex.). *Gastroenterology* 68(4):995, 1975.

6781 STUDIES ON ACID-BASE BALANCE IN AMPHIBIAN GASTRIC MUCOSA. *(E.)* Silen, W.; Machen, T. E.; Forte, J. G. (Dep. Physiol-Anat., Univ. California, Berkeley, Calif.). *Gastroenterology* 68(4): 987, 1975.

6782 PREPARATION AND CHARACTERIZATION OF ISOLATED VIABLE MAMMALIAN PARIETAL CELLS. *(E.)* Lewin, M.; Cheret, A. M.; Bonfils, S. (INSERM U. 10, Hosp. Bichat., Paris, France). *Gastroenterology* 68(4):955, 1975.

6783 VARIABILITY OF ACID OUTPUT IN REPEATED GASTRIC ANALYSIS. *(E.)* Meeroff, J. C.; Marchevsky, N.; Meeroff, M. (Univ. Buenos Aires, Buenos Aires, Argentina). *Gastroenterology* 68(4): 953, 1975.

6784 DETERMINANTS OF GASTRIC EMPTYING IN THE DOG. *(E.)* Krejs, G. J.; Sauberli, H.; Largiader, F.; Schmid., P.; Hegglin, J.; Blum, A. L. (Stadtspital Triemli, Zurich, Switzerland). *Gastroenterology* 68(4): 930, 1975.

6785 STIMULATION OF ACID SECRETION BY L- AND D-ISOMERS OF AMINO ACIDS BATHING THE OXYNTIC GLAND AREA. *(E.)* Konturek, S. J.; Tasler, J,; Obtulowicz, W. (Inst. Physiol., Kracow, Poland). *Gastroenterology* 68(4):928, 1975.

6786 CARBONIC ANHYDRASE ACTIVATION IN THE RAT STOMACH RESULTING FROM THE PHOSPHORYLATION OF ITS 3',5'-AMP-DEPENDENT PROTEIN KINASE. *(Rus.)* Bersimbaev, R. I.; Konstantinov, Iu. M.; Argutinskaia, S. V.; Salganik, R. I. (Inst. Cytology Genetics, Sovosibirsk, USSR). *Biokhimiia* 40(3):570-576, 1975.

6787 THE EFFECT OF SINGLE AND REPEATED DOSES OF NICOTINE ON THE GASTRIC MUCOSA OF IMMOBILIZED RATS. *(Ger.)* Schnoy, N.; Droszus, J. U.; Niedobitek, F.; Schmid, E. (Pathologisches Institut, Freie Universitat, Berlin, Germany). *Z. Gastroenterol.* 13(4):445-451, 1975.

6788 GASTRIC SECRETION OF ACID IN HEALTHY CHILDREN. *(Pol.)* Socha, J.; Cichy, W.; Biedrzynska, B. (Zaklad Propedeutyki Pediatrii AM, ul. Szpitalna 27/31, 60-572, Poznan, Poland). *Pediatr. Pol.* 50(5):569-575, 1975.

6789 THE EXPERIMENTAL BASIS OF A NEW METHOD IN THE SURGICAL TREATMENT OF DUODENAL ULCER: THE CHEMICAL SCLEROSIS OF THE GASTRIC MUCOSA. *(Fr.)* Mandache, F.; Ghergut, A.; Stratulat, L.; Popescu, G.; Giuroiu, V.; Pahomeanu, M.; Ciocilteu, P. (No affiliation given). *Chirurgie* 101(2):129-138, 1975.

6790 STUDIES ON DUODENAL REGULATION OF GASTRIC SECRETION. *(Jpn.)* Yunoki, K.; Ichiki, T.; Matsumoto, M.; Morita, N.; Nakao, Y.; Miyahara, K.; Futagawa, T.; Chung, J.; Arima, K. (Inst. Cancer Research, Kagoshima Univ., Japan). *Igaku Kenkyu* 44(2):56-68, 1974.

6791 SIGNIFICANCE OF THE STOMACH ANTRAL PORTION FOR THE CONTROL OF ITS SECRETORY ACTIVITY. *(Rus.)* Pavlova, N. S. (Pavlov's Inst. Physiology, Acad. Sci. USSR, Leningrad, USSR). *Fiziol. Zh. SSSR im. I.M. Sechenova* 61(3):428-432, 1975.

6792 ON HYDROLYSIS OF FOOD PROTEIN IN THE STOMACH. *(Rus.)* Korotko, G. F.; Chalakov, A. K.; Sukhoterin, V. G.; Saidbaeva, L. M.; Apraksin, V. P. (State Medical Inst., Andizhan, USSR). *Fiziol. Zh. SSSR im. I.M. Sechenova* 61(3):415-422, 1975.

6793 BEHAVIOR OF MICROFLORA IN THE RAT STOMACH: ADHESION OF Lactobacilli TO THE KERATINIZED EPITHELIAL CELLS OF THE RAT STOMACH IN VITRO. *(E.)* Suegara, N.; Morotomi, M.; Watanabe, T.; Kawai, Y.; Mutai, M. (Yakult Inst. for Microbiological Res., 1796, Yaho, Kunitachi, Tokyo, Japan). *Infect. Immun.* 12(1):173-179, 1975.

6794 VARIATIONS IN SERUM GASTRIN CONCENTRATION AFTER FEEDING IN MAN, DOG, AND PIG. *(E.)* Brandsborg, O.; Brandsborg, M.; Rokkjaer, M.; Bone, J.; Lovgreen, N. A.; Amdrup, E. (Kommunehospitalet, Arhus Univ., Arhus, Denmark). *J. Surg. Res.* 10(1): 1-4, 1975.

6795 THE EFFECT OF CARBACHOL AND PENTAGASTRIN ON THE GASTRIC SECRETION OF ACID, PEPSIN, AND INTRINSIC FACTOR (IF) IN MAN. *(E.)* Vatn, M. H.; Schrumpf, E.; Myren, J. (Ulleval Univ. Hosp., Oslo 1, Norway). *Gut* 15(11):55-58, 1974.

6796 SECRETIN SNUFF: EVALUATION OF THE ACTION ON PENTAGASTRIN-STIMULATED GASTRIC ACID SECRETION AND ON PANCREATIC BICARBONATE PRODUCTION. *(E.)* Halter, F.; Witzel, L.; Kohler, B.; Hadorn, B. (Univ. Berne, Inselspital Berne, Switzerland). *Gut* 15(11):81-85, 1974.

6797 EFFECT OF SEVERE ANOXIA AND SODIUM TAUROCHOLATE ON H^+ LOSS FROM LUMINAL SURFACE OF IN VITRO GASTRIC MUCOSA. *(E.)* Birkett, D.; Silen, W. (Beth Israel Hosp., Boston, Mass.). *Surg. Forum* 24:421-424, 1973.

6798 ROLE OF GASTRIN IN SHORT-BOWEL GASTRIC HYPERSECRETION. *(E.)* Wickbom, G.; McGuigan, J. E.; Landor, J. H. (Coll. Medicine, Univ. Florida, Gainesville, Fla.). *Surg. Forum* 24:353-354, 1973.

6799 EFFECT OF VAGOTOMY ON GASTRIN CONTENT OF GASTRIC FUNDUS AND ANTRUM AND PANCREAS IN RATS. *(E.)* Becker, H. D.; Reeder, D. D.; Thompson, J. C. (Univ. Texas Medical Branch, Galveston, Tex.). *Surg. Forum* 24:359-360, 1973.

6800 THE STABILITY OF HUMAN PEPSINS IN STORED GASTRIC JUICE. *(E.)* Whitecross, D. P.; Piper, D. W. (Royal North Shore Hosp., Sydney, St. Leonards, Australia). *Scand. J. Gastroenterol.* 10(4):395-399, 1975.

See also, 6600, 6602, 6615, 6959, 6968, 6971, 6980, 6982, 6999, 7136, 7148, 7159, 7251, 7289, 7291, 7295.

SECRETION AND METABOLISM

Pancreas

6801 IDENTIFICATION OF ENZYMES IN HUMAN PANCREATIC JUICE. *(Fr.)* De Caro, A.; Guy, O.; Crotte, C.; Figarella, C. (Unite de Recherche de Pathologie Digestive, U-31 INSERM, 46 chemin de la Gaye, F 13009 Marseille, France). *Arch. Fr. Mal. App. Dig.* 64(2):115-123, 1975.

Using fibroscopic techniques, human pancreatic juice was extracted by draining the duct of Wirsung from subjects not suffering from pancreatitis. The aim was to study human pancreatic enzymes and zymogens having been separated by polyacrylamide gel electrophoresis at pH 5.0 in a homogeneous system. A competitive inhibitor with trypsin was added to make clear the number of pancreatic zymogens in pancreatic juice with the artifacts of zymogen activation products. Pancreatic bands were identified by immunological techniques or by comparison with the electrophoretic migration of purified proteins. Two immunologically distinct chymotripsinogens, two immunologically identical proelastases, two trypsinogens, one procarboxypeptidase A, one procarboxypeptidase B, one nonspecific esterase, one prophospholipase, three isoamylases, and two isolipases (the latter two being glycoproteins) were reported. The main value of this work is the establishment in one operation of the semitotality of human pancreatic juices enzymatic content, to enable rapid comparisons among individuals.

6802 CIRCULATORY TURNOVER OF PANCREATIC AMYLASE. *(E.)* Ryan, J.; Appert, H. (Hahnemann Medical Coll. and Hosp., Philadelphia, Pa. 19102). *Proc. Soc. Exp. Biol. Med.* 149(4):921-925, 1975.

The plasma disappearance of i.v. infused radio-iodinated amylase and unlabeled porcine pancreatic amylase in pigs was examined. Radiolabeled (^{125}I) amylase and unlabeled pancreatic amylase were infused into 18 adult pigs of both sexes in order to determine the plasma half-life of the enzyme. Regardless of the parameter measured (radioactivity, enzyme activity, or concentration), the plasma removal curves could be resolved into three components when subjected to tracer analysis. The plasma half-life was estimated to be approximately three hr. Through the use of a recently developed radioimmunoassay specific for porcine amylase, the plasma concentration of amylase was calculated at 2.4 μg/ml. Based on the plasma concentration and half-life of amylase, the circulatory turnover of the enzyme was determined. Over a 2.4-hr period, 9.6 μg of pancreatic amylase/ml of plasma must reenter the circulation to maintain the enzyme at constant levels.

6803 BINDING OF BILE SALTS TO PANCREATIC COLIPASE AND LIPASE. *(E.)* Borgstrom, B.; Donner, J. (Dept. Physiological Chemistry, Univ. Lund, Sweden). *J. Lipid Res.* 16(4):287-292, 1975.

Equilibrium dialysis and gel filtration were used to study the interaction between colipase and bile salts in solution. Lipase and colipase were purified from porcine pancreas. The binding of taurodeoxycholate, glycodeoxycholate and taurocholate to colipase at 25 C in 150 mM of NaCl, 1 mM of CaCl$_2$ and 2 mM of Tris-HCl, pH 7.0, was measured by equilibrium dialysis. No binding took place below the critical micellar concentration for the bile salts. Above this concentration, the binding increased sharply for the dihydroxy conjugates, reaching values of 12 to 15 M/M of colipase. The binding of sodium dodecyl sulfate to colipase was found to be similar to that for bile salt and colipase; there was no binding below the concentration below the critical micellar concentration and there was a rapid increase above that point, reaching extrapolated figures of 40 to 50 M/M of colipase. A Sephadex G-100 column was equilibrated with a solution of 4 mM in ^{35}S-labeled taurodeoxycholate, 150 mM in NaCl, 1 mM in CaCl$_2$ and 2 mM in Tris-maleate, pH 7.0. Colipase (450 nM) dissolved in 0.5 ml of this solution was applied to the column. There was no apparent binding at low and high ligand concentrations. These results indicate that at physiological ionic strength and pH, conjugated bile salts bind micelles to colipase; 12 to 15 M/M of colipase for the dihydroxy conjugates and 2 to 4 for the trihydroxy conjugates. No binding of bile salts took place from monomeric solutions. Under the same experimental conditions, only 1 to 2 M of conjugated dihydroxy bile salts bound to pancreatic lipase. It is concluded that colipase may serve as a nucleus for micellization.

6804 THE INFLUENCE OF DETERGENTS AND TRYPSIN ON THE STIMULATION OF AMYLASE SECRETION BY EITHER PANCREOZYMIN OR SODIUM FLUORIDE IN THE PERFUSED RAT PANCREAS.

(Eng.) Robberecht, P.; Deschodt-Lanckman, M.; Camus, J.; Cristophe, J. (Univ. Brussels Medical Sch., B-1000 Brussels, Belgium). *Biochem. Pharmacol.* 24(17):1623-1629, 1975.

The effects of detergent and trypsin on the time course of pancreatic amylase secretion and on the stimulation of secretion by pancreozymin and sodium fluoride were studied *in vitro* using pancreatic tissue from male Wistar rats. Pancreas fragments were perfused for 2 hr with Krebs-Ringer bicarbonate buffer containing 10 mM of glucose and Trasylol (500 UIK/ml). In some experiments, digitonin, sodium dodecylsulfate, Triton X-100 or bovine trypsin (0.010, 0.025 or 0.050%) were added to the incubation medium for 30 min, after which the tissues were perfused with normal Krebs-Ringer-glucose medium for 30 min. Pancreozymin (320 U/ml) or NaF (10 mM) was added after this second 30-min period. α-Amylase in the perfusion medium and in the tissue fragments was estimated at 5-min intervals by the saccharogenic technique. In the absence of any of the added agents, the basal output of amylase decreased rapidly during the first 10 min, thereafter remaining stable at about 0.4% of the initial tissue content/5 min. The basal output increased with increasing concentrations of digitonin and sodium dodecylsulfate and with high concentrations of Triton X-100, but not with added trypsin. In the absence of any of these four agents, pancreozymin (7×10^{-9} M) rapidly stimulated amylase output, a two-fold increase over basal levels being attained within 20 min and thereafter remaining stable. This stimulation decreased progressively and finally disappeared after pretreatment with increasing concentrations of the three detergents or trypsin. NaF caused a biphasic stimulation of amylase secretion; the rapid initial peak was unspecific and related only to the NaF-induced rise in osmolarity, while the second, prolonged wave was due to NaF itself. Preexposure to detergent or to trypsin had no effect on the initial peak but caused a decrease in the second peak. However, sodium dodecylsulfate and digitonin in concentrations which abolished the secretory response to pancreozymin merely inhibited the second secretory effect due to NaF; Triton X-100 and trypsin were equally effective in abolishing the secretory responses to pancreozymin and NaF. The data suggest that the *in vitro* regulation of secretion by pancreozymin and NaF in intact acinar cells of the rat pancreas involves two distinct loci of a membrane-lipoprotein complex.

6805 PANCREATIC SECRETION OF TOTAL PROTEIN AND OF THREE HYDROLASES COLLECTED IN HEALTHY SUBJECTS VIA DUODENOSCOPIC CANNULATION.

(E.) Robberecht, P.; Cremer, M.; Vandermeers, A.; Vandermeers-Piret, M. C.; Cotton, P.; De Neef, P.; Christophe, J. (Univ. Brussels Medical Sch., Waterloo Blvd. 115, B-1000 Brussels, Belgium). *Gastroenterology* 69(2): 374-379, 1975.

The effects of secretin (1 Crick-Harper-Raper [CHR] U/kg), pancreozymin (CCK-PZ) (1 CHR U/kg), and cerulein (20 μg/kg) on the pancreatic secretion of total protein, amylase, lipase, and chymotrypsinogen were studied in 10 fasted male and female subjects free of gastrointestinal disease. The main pancreatic duct was cannulated to a depth of 2-3 cm, *N*-butylscopalammonium bromide being used to suppress duodenal peristalsis. The pancreatic juice was collected at 1-min intervals for up to 30 min; secretin injected i.v. at time zero and CCK-PZ or cerulein was injected 10-20 min later. Rapid i.v. secretin produced an immediate stimulation of protein and amylase secretion of 2-4 min duration and a sustained rise in flow rates. CCK-PZ produced a prompt 5- to 10-fold rise in the concentration and output of amylase and protein, the effect on volume secretion being relatively small compared with that on enzyme and protein secretion. The half-life of the CCK-PZ effect was 70-100 sec. Cerulein also stimulated the pancreatic secretion of protein and amylase; the pattern, magnitude, and duration of the response were the same as that produced by CCK-PZ. In addition, cerulein significantly stimulated the secretion of lipase and chymotrypsinogen. After stimulation of secretion, there was no significant change in the specific activity of chymotrypsinogen or in the ratios of the enzyme activities. The half-life of the effect of CCK-PZ and cerulein on pancreatic secretion was independent of flow rate and maximum protein output. The results are at variance with those previously reported in the cat and rabbit.

6806 GLUCAGON RELEASE: PARADOXICAL STIMULATION BY GLUCOSE DURING CALCIUM DEPRIVATION.

(E.) Leclercq-Meyer, V.; Rebolledo, O.; Marchand, J.; Malaisee, W. J. (Lab. Experimental Medicine, Univ. Brussels, 1000 Brussels, Belgium). *Science* 189(4206):897-899, 1975.

The paradoxical stimulation of glucagon release by glucose during calcium deprivation was studied in unfasted female albino rats. The pancreases of these animals were perfused *in situ* with Krebs-Ringer bicarbonate buffer containing bovine albumin (4 g/100 ml), glucose (3.3-16.6 mM, during the first 80 min), and calcium (2 mM, during the first 40 min). The effluent was assayed for glucagon and insulin by radioimmunoassay. Glucose (8.3 or 16.6 mM) stimulated insulin release during calcium administration but not during calcium deprivation. The output of glucagon during calcium administration was inversely related to the glucose concentration in the perfusion medium, calcium deprivation consistently provoking an enhancement of glucagon secretion. The effect of calcium deprivation was reversible. The positive secretory response of the pancreatic alpha cell to calcium deprivation consisted of two components: the first was characterized by an immediate, sharp, and short-lasting (about 4 min) peak of secretion which was most evident at the lowest glucose concentration; and the second, or late secretory phase, was absent at the lowest glucose concentration but was characterized by a long-lasting stimulation of glucagon release at higher glucose levels. It is suggested that the paradoxical stimulation of glucose during calcium deprivation, which is reminiscent of the abnormality of glucagon secretion observed in diabetes mellitus, results from a perturbation in the normal structural and functional bridging between pancreatic alpha and beta cells.

6807 COMPARISON OF SECRETIN AND VASOACTIVE INTESTINAL PEPTIDE ON PANCREATIC SECRETION IN DOGS. *(E.)* Konturek, S. J.; Thor, P.; Dembinski, A.; Krol, R. (Medical Acad., Krakow, ul. Grzegorzecka 16, Poland). *Gastroenterology* 68(6):1527-1535, 1975.

The action of the vasoactive inhibitory peptide (VIP) on pancreatic secretion under basal conditions and in response to secretin or cholecystokinin was studied in chronic pancreatic fistula mongrel dogs (three). Dogs were also provided with gastric fistulas. Graded i.v. doses of VIP and secretin produced a dose-related secretory response at 8 μg/kg/hr and 4 U/kg/hr, resp. The maximal bicarbonate response to VIP (0.75 mEq/30 min) was about 17% of that to secretin. Both cerulein (100 ng/kg/hr) and endogenous cholecystokinin released by a peptone meal potentiated pancreatic bicarbonate response similarly to secretin. From the dose-response curves to secretin alone and secretin plus VIP, Michaelis-Menten analysis showed competitive inhibition. Maximal inhibition occurred with 8 μg of VIP. These data indicate that VIP is a potent inhibitor of secretin-induced pancreatic secretion, and suggest that VIP and secretin share a common receptor site.

6808 SOMATOSTATIN SUPPRESSES SECRETIN AND PANCREATIC EXOCRINE SECRETION. *(Eng.)* Boden, G.; Sivitz, M. C.; Owen, O. E.; Essa-Koumar, N.; Landor, J. H. (Temple Univ. Health Sci. Center, Philadelphia, Pa. 19140). *Science* 190(4210):163-165, 1975.

The effects of somatostatin on the release of immunoreactive secretin (IRS) from the proximal small intestine and the pancreatic secretion of water, bicarbonate and protein were studied in conscious fasted dogs with long-term pancreatic fistulas. Synthetic somatostatin (200 μg, in the cyclic form) infused continuously for 30 min into a hind leg vein had no significant effect on IRS concentrations, but it significantly depressed pancreatic flow and the secretion of bicarbonate and secretin. In contrast, when somatostatin (200 μg/30 min) was infused concurrently with HCl (9.6 mEg/30 min, intraduodenally), the significant rise in IRS concentrations produced by HCl alone was completely abolished. The HCl-stimulated pancreatic flow rate and bicarbonate and protein secretion were also suppressed 67%, 72% and 64%, resp., by somatostatin. The inhibitory effects of somatostatin on IRS release and exocrine pancreatic secretion were short-lived and completely reversible. The data suggest that somatostatin may have a physiologic role in the secretion of pituitary, pancreatic, gastric, and duodenal hormones.

6809 INHIBITION OF PANCREATIC EXOCRINE SECRETION BY VINBLASTINE. *(E.)* Nevalainen, T. J.; (Dept. Pathological Anatomy, Univ. Turku, Finland). *Res. Exp. Med. (Berl)* 165(2):163-168, 1975.

The role of microtubules in pancreatic enzyme secretion was studied using the microtubule active agent vinblastine. Inbred BALB/c mice were given vinblastine sulfate and/or pilocarpine hydrochloride (20mg/kg) i.p., and amylase activity was determined in pancreatic homogenates. Vinblastine sulfate (200 mg/kg) given i.p. did not alter the pancreatic amylase content under the conditions of the experiment. Pilocarpine significantly decreased pancreatic amylase content within 2 hr. Pretreatment with vinblastine abolished this stimulatory effect of pilocarpine in a dose-dependent fashion at doses of 4, 40, and 400 mg/kg. These results are not unequivical proof of microtubule involvement in the secretory mechanisms in pancreatic acinar cells. Other effects of vinblastine must be considered, such as disturbances of amino acid metabolism, anticholenergic actions, and possible cell damage. The role of microtubules in the secretory mechanism of pancreatic acinar cells awaits further clarification.

6810 ENZYME SECRETION IN THE ABSENCE OF ZYMOGEN GRANULES. *(E.)* Rothman, S. S. (Dept. Physiology, Univ. California, San Francisco, Calif. 94143). *Am. J. Physiol.* 228(6):1828-1834, 1975.

The secretion of digestive enzymes was compared to the number of zymogen granules within the acinar cells in fasted and anesthetized adult male Holtzman rats. Pure pancreatic juice was collected from the cannulated common bile duct. Digestive enzyme secretion was studied before and after progressive degranulation of acinar cells produced by three s.c. doses of 0.8 mg/kg of methacholine chloride (a cholinergic stimulator). The kinetics of degranulation was estimated from the relative cell volume occupied by electron-opaque granules at various times using a random point-count stereological technique to examine tissue sections. Electron microscopic examinations showed that the three injections produced the almost complete disappearance of electron-opaque granules from secretory cells. Greatly augmented enzyme secretion was still observed: 10-fold greater for protein output overall; 7-fold greater for trypsinogen; and 25-fold greater for chymotrypsinogen. It is suggested that the movement of enzyme across the cell membrane into the duct system is from the cytoplasm, and that such movement is a final common step in the secretion of digestive enzyme derived from a variety of intracellular pools. However, the quantitative importance of the proposed transport mechanism in the normal process of protein secretion has yet to be determined.

6811 STUDIES ON HYPOXIA. X. EFFECTS OF SYNTHETIC POLYRIBONUCLEOTIDES ON PANCREAS FROM HYPOXIC AND CONTROL RATS: AN ELECTRON MICROSCOPIC AND BIOCHEMICAL STUDY. *(E.)* Kim, Y. G.; Han, S. S. (Univ. Michigan Sch. Medicine, Ann Arbor, Mich. 48104). *Exp. Mol. Pathol.* 23(1):43-58, 1975.

The effect of a mixture of synthetic polyadenylic and polyuridylic acids (poly A:U) on the structure and function of pancreatic acinar cells after prolonged hypoxia was studied. Sprague-Dawley rats were placed in a chamber with 12% O_2 and 88% N_2 for seven days. A homopolymer of poly (A:U) was injected i.p. at 1 mg/kg 24 hr before sacrifice. Pancreatic tissue was fixed with paraformaldehyde and OsO_4 for electron microscopy and stained with toluidine blue for light microscopy (nucleolar index was calculated from the number of nucleoli/number of nuclei x 100). For biochemical analysis, tissues were homogenized and counted by liquid scintillation spectrometry. Alpha amylase content was measured to indicate synthetic activity. Light microscopy showed that poly (A:U) treatment had little effect on controls, but in hypoxic rats there were smaller and fewer zymogen granules, the Golgi complex was enlarged, and the number and size of nucleoli was increased. The nucleolar index went from 73 in untreated to 88 in poly (A:U)-treated rats; there was a 21% increase in controls. In contrast, hypoxic rats showed an increase of from 61 in untreated to 85 in treated rats--a 40% increase. Ultrastructurally, poly (A:U)-treated control rats showed extensive development of the Golgi complex with condensing vacuoles of the distal portions of the cisternae increased in number. Treated hypoxic rats were similar. Occasionally, treated control rats had numerous zymogen granules in the rough endoplasmic reticulum cisternae. Biochemical tests showed that the DNA content of both control and hypoxic rats receiving poly (A:U) was 129% and 108%, resp., of those not receiving it. The difference between the hypoxic groups receiving and not receiving poly (A:U) was insignificant. Total protein in μg of protein/μg DNA after treatment was reduced to 68% and 75%, resp., in control and hypoxic groups from those not treated. Amylase content in treated rats was reduced to 89% in control and to 71% in hypoxic rats. Controls treated with poly (A:U) were lower in radioactivity (68%) than those untreated. The acid soluble fraction from treated controls was 63% of those untreated, while that of treated hypoxic rats was 54% of those untreated. Treatment produced an increase in radioactivity (172%) in hypoxic cells. It is concluded that poly (A:U) stimulates the functioning of the Golgi complex in rat acinar cells, consequently increasing protein synthesis, and to a greater extent in hypoxic rats.

6812 THE TRYPSINOGEN AND CHYMOTRYPSINOGEN CONTENTS OF THE PANCREAS DURING ACUTE EXPERIMENTAL PANCREATITIS OF THE RAT. *(E.)* Huttunen, R. (Dep. Anatomy, Univ. Oulu, 90220 Oulu, Finland). *Scand. J. Gastroenterol.* 10(2):177-180, 1975.

The fate of trypsinogen and chymotrypsinogen during inflammation of the pancreas was studied in rats. Long-Evans rats were divided into three groups: 1) controls; 2) rats killed 2 hr after induction of pancreatitis; and 3) rats killed 8 hr after induction. The time needed for maximal proenzyme activation was determined by incubating a mixture of the pancreatic supernatant, enterokinase and the buffer at 37 C. Aliquots were taken at various intervals, and free trypsin and chymotrypsin activities were estimated, using N-α-benzoyl-DL-arginin-4-nitroanilid hydrochloride and succinyl-L-phenylalanine-p-nitroanilide as substrates. Activation of chymotrypsinogen was more rapid than the activation of trypsinogen, with maximal activation occurring in 3 hr, while activation of trypsinogen required 17 hr. The content of both proenzymes decreased significantly during pancreatitis. In 8 hr the decline of trypsinogen content was 28.4% and that of chymotrypsinogen was 44.9% from the proenzyme content of the normal resting rat pancreas. No correlation was found between the trypsinogen and chymotrypsinogen content of the normal pancreas, but they were clearly correlated during pancreatitis. These data indicate that during pancreatitis, proenzymes and/or proteases are freed. It is suggested that the correlation between the proenzyme contents during inflammation reflects the amount of viable pancreatic tissue and the rate of synthesis.

6813 ELECTROPHORESIS AND ISOELECTRIC FOCUSING IN POLYACRYLAMIDE GEL. ADVANCES OF METHODS AND THEORIES, BIOCHEMICAL AND CLINICAL APPLICATIONS. *(Ger.)* Tympner, V. F.; Domschke, S.; Domschke, W.; Demling, L. (Medizinischen Klinik der Poliklinik, Univ. Erlangen-Nurnberg, Germany). *Fortschr. Med.* 93(12):627-630, 1975.

6814 EFFECT OF FUROSEMIDE ON PANCREATIC EXOCRINE FUNCTION. *(E.)* Thomas, F. B.; Falko, J. M.; Caldwell, J. H.; Mekhjian, H. S. (Dep. Med., Ohio State Univ., Columbus, Ohio). *Gastroenterology* 68(4):998, 1975.

6815 MICROPUNCTURE STUDY OF ELECTROLYTE SECRETION IN THE CAT PANCREAS. *(E.)* Reber, H. A.; Lightwood, R.; Zakula, S. (VA Hosp., San Francisco, Calif.). *Gastroenterology* 68(4):972, 1975.

6816 IN VITRO GLUCAGON RELEASE BY VASOACTIVE INTESTINAL PEPTIDE (VIP). *(E.)* Schebalin, M.; Said, S. I. (Med. Coll. Virginia, Richmond, Va.). *Gastroenterology* 68(4):941, 1975.

6817 STUDIES ON THE ORGAN CULTURE OF RAT PANCREAS. I. THE EFFECTS OF TEMPERATURE AND GAS PHASE ON THE MAINTENANCE OF RAT PANCREAS IN ORGAN CULTURE. *(Jpn.)* Ikegami, T. (First Dept. Internal Medicine, Kyushu Univ., Kukuoka, Japan). *Fukuoka Acta Med.* 65(5):249-258, 1974.

6818 REACTION OF THE PANCREAS TO ITS RESECTION IN EXPERIMENTAL ANIMALS. *(Rus.)* Mikhailichenko, V. A. (Donetsk Medical Inst., Donetsk, USSR). *Ekspr. Khir. Anesteziol.* (1):40-41, 1975.

6819 EFFECT OF 2,4,6-TRIMETHOXYPHENYL(3-PYRROLIDINO)PROPYL KETONE ON EXOCRINE PANCREATIC AND BILIARY SECRETION IN THE RAT. *(Fr.)* Debray, C.; Vaille, C.; De La Tour, J.; Roze, C.; Souchard, M. (Hosp. Bichat, Paris, France). *Therapie* 30(2):259-266, 1975.

6820 FUNCTIONAL CORRELATIONS IN AUXILIARY PANCREAS TRANSPLANT IN DOGS. EVALUATION TECHNIQUE. *(It.)* Roti, E.; Morosini, S.; Cavazzini, G.; Roncoroni, L.; Vescovi, P. P.; Manfredi, A.; Zola, C.; Foggi, E.; Violi, V.; Gnudi, A.; Peracchia, A. (Istituto di Patologia Speciale Medica, Universita di Parma, 43100 Parma, Italy). *Ateneo Parmense [Acta Biomed.]* 45(4-5):247-255, 1974.

6821 LAPAROSCOPY AND BIOPSY OF THE PANCREAS IN MINIATURE PIGS AND PIGLETS: A NEW WAY FOR INVESTIGATIONS OF THE PANCREAS IN ANIMAL EXPERIMENTS. *(E.)* Klapdor, R.; Humke, R. (I. Med. Klinik, 2000 Hamburg, Germany). *Endoscopy* 6(4):248-250, 1974.

6822 ELECTRON MICROSCOPIC OBSERVATIONS ON CYSTIC FIBROSIS OF THE PANCREAS IN A CAT. *(E.)* Suzuki, Y.; Watari, N. (Dept. Veterinary Anatomy, Gifu Univ., Fifu-ken, Japan). *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3-4):344, 1974.

6823 PROLONGATION OF PANCREATIC ALLOGRAFT SURVIVAL BY 5-FLUOROURACIL. *(E.)* Castellanos, J.; Manifacio, G.; Toledo-Pereyra, L.; Lillehei, R. C.; Shatney, C. H. (Univ. Minnesota Health Sciences Center, Minneapolis, Minn.). *Am. J. Surg.* 130:53-56, 1975.

See also, 6610, 6611, 6796, 6799, 6941, 6952, 6974, 7548, 7563, 7574.

SECRETION AND METABOLISM

Hepatobiliary Tract

6824 SCANNING ELECTRON MICROSCOPE STUDY OF DISSE SPACES AND CAPILLARIES IN RAT LIVER. *(Fr.)* Motta, P.; Porter, K. R. (Istituto di Anatomia Umana Normale, Universita di Roma, Viale Regina Elena 289, Roma, Italia). *Bull. Assoc. Anat.* 58(162):631-638, 1974.

Scanning electron microscopy (SEM) was used to study the relation between the capillaries and the hepatic cells in normal adult rats. Five anesthesized rats were injected through the left ventricle with a Tyrod solution containing oxygen and 0.1% procaine and heparin. Thirty seconds later a 2.5% buffered glutaraldehyde solution (0.18M, pH 7.3) was used to fix the organs. After dehydration, temperature of the pieces was lowered to the critical point in liquid CO_2. SEM demonstrated that the thin endothelial cells lining the rat sinusoids had a large number of fenestrations varying greatly in size. The presence of Kupffer cells and the existence of double layered endothelial cells could limit speed of filtration. The capillaries of the Disse space were obvious on all hepatic cells cemented to form biliary canals, yet there was never a communication between these canals and the sinusoids. In some places the Disse sinusoids actually became intracellular canaliculi, hence creating a network of interstitial lymph. The result is an increased exchange surface between hepatocytes, endothelial cells and the interstitial lymph.

6825 SCANNING ELECTRON MICROSCOPY DEMONSTRATION OF CILIA IN RAT INTRAHEPATIC BILE DUCTS. *(E.)* Motta, P.; Fumagalli, G. (Dept. Anatomy, Univ. Rome, Italy). *Z. Anat. Entwicklungsgesch.* 145(3):223-226, 1974.

Scanning electron microscopy was used to study cilia in the rat intrahepatic bile ducts. The lumen of portal and perilobular bile ducts and ductules appeared to be lined with numerous, small microvilli along with irregularly scattered, long cilia. These cilia arose perpendicularly as isolated, thin, cylindrical evaginations of the cell surface. They measured 0.2 μ in thickness and 0.5 μ in length. The surfaces of the cilia were finely granulated with some spherical swellings at the tips and along the surface. The cilia appeared more numerous in the larger portal ducts. It was suggested that these cilia are engaged in continual mixing and propulsion of the bile product or may serve in slowing bile flow, thus promoting its partial reabsorption. The occurrence of similar cilia in pancreatic ducts serves as a basis of speculation as to a common function to both organs.

6826 ASSESSMENT OF LYSOSOME MEMBRANE STABILITY. *(Rus.)* Pokrovskii, A. A.; Tutelian, V. A.; Kravchenko, L. W. (Inst. Nutrition, Moscow, USSR). *Biokhimiia* 40(3):545-551, 1975.

The effects of different concentrations of non-ionic detergents, triton X-100, triton X-305, BRIJ-35 and triton WR-1339, on the general and non-sedimentary activity of eight enzymes in liver lysosomes of male Wistar rats were determined. The enzymes investigated were: acid phosphatase, acidic DNase, acidic RNase, arylsulfatases A and B, glucuronidase, galactosidase, glucosidase, and acetylglucosaminidase. Lysosomal fractions were isolated by differential centrifugation. Subsequently, 5 ml portions of lysosomal suspension were mixed with 0.1 ml portions of 0.05, 0.1, 0.5, 1.0 and 2.0% detergent solutions, incubated for 15 min at 25C, and centrifuged. The non-sedimentary activity was determined by spectrophotometry. Only triton X-100 (0.1%) caused full release of lysosomal enzymes. The degree of release of acidic DNase, B-galactosidase, B-glucuronidase, and acid phosphatase were considerably higher than of the other enzymes. A method was developed for serial investigation of the stability of lysosomal membranes in animals with various physiological and pathological conditions. The method consisted of treating isolated structures with increasing concentrations of triton X-100 (0.025, 0.05, and 0.01%) with the subsequent determination of non-sedimentary activity marking the enzymes.

6827 DETERMINATION OF THE SPECIFIC BLOOD FLOW OF THE LIVER BY INHALATION OF RADIOACTIVE RARE GASES. *(E.)* Schmitz-Feuerhake, I.; Huchzermeyer, H.; Reblin, T. (Medizinische Hochschule Hannover, 3 Hannover-Kleefeld, Karl Wiechert Allee 9, West Germany). *Acta Hepato-Gastroenterol.* 22(3):150-158, 1975.

A new technique involving the inhalation of radioactive xenon was used to study the specific blood flow of the liver in human livers of known fat content. The subjects inhaled a mixture of ^{133}Xe and air at a concentration of 1 μCi/ml for 2.5 min. Scintillation detectors were arranged over the liver and spleen for the registration of 81 keV-γ-radiation. A double isotope measurement using ^{133}Xe parallel to radioactive krypton was employed to determine the dependence of the partition coefficient on the liver fat content. Using the ^{133}Xe inhalation technique, an average blood flow of 91 ml/100 g/min was found in people with healthy livers; the reproducibility of the values was 5%. The xenon wash-out was delayed in cirrhotic livers, the blood flow being significantly decreased to an average value of 45 ml/100 g/min. A delayed wash-out of xenon was also found in major fatty livers due to xenon's high affinity for fat. Thus, a retarded wash-out of xenon can mean a reduced blood flow or a major fatty degeneration. The double isotope measurements in patients with known liver fat content showed a good conformity in livers with fat contents less than 10%. In the case of higher fat content, it was not possible to determine the blood flow with satisfactory accuracy due to an inability to accurately determine the partition coefficient. The method should therefore be suitable only for relative measurements.

6828 BIOPHARMACEUTICAL STUDY OF THE HEPATOBILIARY TRANSPORT OF DRUGS. III. BINDING CHARACTERISTICS OF BROMPHENOL BLUE AND AMARANTH TO THE LIVER CYTOPLASMIC Y AND Z BINDING PROTEINS *IN VITRO. (E.)* Takada, K.; Narumiya, O.; Muranishi, S. (Faculty Pharmaceutical Sciences, Kyoto Univ., Yoshida-shimoadachi-cho, Sakyo-ku, Kyoto, Japan). *Chem. Pharm. Bull. (Tokyo)* 23(4):729-735, 1975.

The binding properties of the Y and Z binding proteins for two organic anionic compounds (bromphenol blue and amaranth) were investigated by modification of the proteins with sulfhydryl-blocking reagents, amino acid group modifiers, and fluorescent probe. Isolated perfused livers were obtained from male Sprague-Dawley rats. The binding of bromphenol blue appeared to be independent of ionic strength. With greater pH, the binding of this compound with both proteins decreased. Amaranth had a higher affinity for the Y and Z proteins (5.67 x 10^4 and 1.43 x 10^4 M^{-1}, resp.) than for bovine serum albumin (1.33 x 10^4 M^{-1}). There was a reverse result obtained, however for bromphenol blue, which had higher affinities for bovine serum albumin (6.58 x 10^5 M^{-1}) than for the Y or Z proteins (1.29 x 10^5 and 1.39 x 10^5 M^{-1}, resp.). There was no significant inhibition of binding observed by any of the sulfhydryl blocking reagents (*p*-chloromercuribenzoic acid, *p*-chloromercuribenzene sulfonic acid, N-ethylmaleimide, and iodoacetamide) on binding of either amaranth or bromphenol blue to either the Y or Z proteins. The binding of bromphenol blue to either protein was inhibited by the amino group modifiers: succinic anhydride (51.9 and 91.2%); maleic anhydride (96.8 and 84.5%); and acetic anhydride (50.5 and 24.2%), for the Y and Z proteins, resp. The binding of amaranth was not so greatly inhibited. Fluorescent probe showed that the binding of amaranth to the Y protein especially and of bromphenol blue to a lesser extent to both proteins was mainly due to hydrophobic forces. It is concluded that plasma protein-binding does not determine hepatobiliary transport of organic anionic compounds.

6829 Z PROTEIN IN HEPATIC UPTAKE AND ESTERIFICATION OF LONG-CHAIN FATTY ACIDS. *(E.)* Mishkin, S.; Stein, L.; Fleischner, G.; Gatmaitan, Z.; Arias, I. M. (Albert Einstein Coll. Medicine, Bronx, N.Y. 10461). *Am. J. Physiol.* 228(6):1634-1640, 1975.

Hepatic uptake and esterification of fatty acid were measured following administration of flavaspidic acid to determine whether binding of long-chain fatty acids to Z protein is obligatory in these processes. Fatty acid radioactivity was bound to Z protein in liver *in vivo* after administration of [^{3}H]-oleate (20 μCi) to male Sprague-Dawley rats. The same activity was found in isolated perfused rat livers. Oleate radioactivity bound to Z protein was effectively reduced by pretreatment with flavaspidic acid (340 μM/kg) by 90.2% and by 85.0% in intact and perfused livers, resp. However, plasma clearance, hepatic uptake and esterification of [^{3}H]oleate were not altered by pretreatment with flavaspidic acid. Infusion of flavaspidic acid (340 μM/kg) or BSP (360 μM/kg) increased uptake of [^{3}H]oleate at least twofold, and oleate esterification was decreased by 15 to 30% in isolated perfused livers. These results indicate that Z protein may function as an organic ligand-binding protein, and may be important in fatty acid esterification.

6830 COMPARATIVE UPTAKE OF SULFOBROMOPHTHALEIN BY ISOLATED KUPFFER AND PARENCHYMAL CELLS. *(E.)* Stege, T. E.; Loose, L. D.; Di Luzio, N. R. (Tulane Univ. Sch. Med., New Orleans, La.). *Proc. Soc. Exp. Biol. Med.* 149(2):455-461, 1975.

The effects of serum, albumin, and varying concentrations of ethanol on the uptake of sulfobromophthalein (BSP) by hepatic parenchymal and Kupffer cells isolated from male Sprague-Dawley rats were studied. The isolated cells were suspended in bicarbonate-free Hanks' balanced salt solution containing 5, 10, or 20% isologous rat serum, 2.5, 5, or 10% albumin, or 100, 200, or 400 mg of ethanol/100 ml. BSP (10 μg) was then added to the incubation mixture. Cellulose powder thin-layer chromatography was used to determine the cellular concentrations of BSP and its glutathione conjugate (BSP-GSH). The isolated Kupffer cells did not take up BSP from the incubation medium, and did not form BSP-GSH. The parenchymal cells, on the other hand, showed a maximum BSP uptake of 49.8 μg/10^7 cells after 15 min incubation; after 60 min of incubation, the incubation medium contained no free BSP but did show the presence of BSP-GSH. The rate of and maximum uptake of BSP by the parenchymal cells was inversely related to the concentration of serum or albumin in the incubation medium; the inability of the Kupffer cells to take up BSP from the medium was unaltered by variations in the cell number or in serum concentration. Ethanol had no direct cytotoxic effects and did not alter BSP uptake by the isolated parenchymal cells. The results indicate that the uptake and conjugation of BSP are exclusive functional expressions of the hepatic parenchymal cell population. They also illustrate the potential use of isolated cells as a model system for the rapid and direct assessment of hepatotoxic agents on hepatic cell populations and functions.

6831 SULFATION OF BILE SALTS: A NEW METABOLIC PATHWAY.

(E.) Stiehl, A. (Medizinische Universitatsklinik, Heidelberg, Federal Republic of Germany). *Digestion* 11(5-6):406-413, 1974.

The metabolism of sulfated bile salts in man and the rat is discussed, as is the effect of sulfation on the toxic properties of bile salts. The sulfation of bile salts renders them polar and more water soluble, thus altering their metabolism, excretion, and toxicity. In human bile, considerable amounts of lithocholate can be sulfated both in health and disease, lithocholate being preferentially sulfated in comparison with other bile salts. The urinary excretion of sulfate esters of bile salts represents an important excretory mechanism in patients with cholestatic liver disease. For the most part, only one or two hydroxyl groups of the bile salts excreted in the urine are sulfated. The sulfate bile salts are excreted in the urine more rapidly than nonsulfated bile salts, a phenomenon which may be partially due to the diminished protein binding and/or decreased tubular reabsorption of the former. Although sulfation of bile salts is only known to occur in the liver, it is possible that sulfation by the kidney might contribute to the large amounts of bile salt sulfates in the urine. It is unlikely that sulfated bile salts are responsible for the pruritus in patients with cholestasis. In the rat, less lithocholate is sulfated than in man, although in the rat as in the human the sulfation of bile salts is an important metabolic pathway in the cholestatic liver. Sulfate esters of lithocholate are more rapidly eliminated in the feces and urine of the rat than are the
nonsulfated compounds and it is likely that sul
of lithocholic acid could enhance its fecal eli
tion. Most of the sulfated bile salts in the r
present as taurine or glycine conjugates, the e
matic hydrolysis of which is slower than with t
sulfated compounds. Sulfated bile salts appear
have considerably less liver toxic properties t
the nonsulfated compounds; thus, the sulfation
bile salts becomes important in patients with c
tasis in whom elevated bile salt concentrations
cause liver damage.

6832 INCORPORATION OF ALA-^{14}C IN CIRCULATI
BILIRUBIN AND HEMOGLOBIN HEME OF HEPA

TOMIZED DOGS. *(E.)* Royer, M.; Sfarcich, D. (P
clinico A. Posadas Haedo, Argentina). *Acta Hep*
Gastroenterol. 22(3):139-144, 1975.

The formation of bilirubin from nonhemoglobin s
was studied in intact and hepatectomized mongre
dogs. The fasted dogs were hepatectomized or s
jected to common bile duct cannulation and inje
i.v. with 50 μCi of delta amino-levulinic acid-
(ALA-^{14}C). Blood samples were obtained at 3-hr
vals for 15 hr from the hepatectomized dogs and
and bile samples were taken at 14, 45, 105 and
min, and at 4, 6 and 9 hr from the intact dogs.
radioactivity of bilirubin and heme in the bloo
measured after crystallization. In the hepatec
animals, the blood bilirubin-^{14}C concentration
3 to 6 hr after ALA-^{14}C administration, then sl
declined. During this time, the hemoglobin hem
dioactivity was much lower and rose sluggishly;
bilirubin specific activity was several hundred
that of the hemoglobin heme and the incorporati
isotope was also much greater for the bilirubin
the intact dogs, i.v. ALA-^{14}C produced similar
sults, but the amount of bilirubin-^{14}C produced
hr in the hepatectomized animals was only about
of the total blood bilirubin-^{14}C in the intact
mals. Nonhemoglobin bile production in the int
dogs was only about 4.2% of the total bile prod
tion. The results indicate that bilirubin is p
duced outside the liver by a mechanism other th
breakdown of hemoglobin.

6833 PRODUCTION OF URIC ACID IN THE HUMAN
DURING PARENTERAL ADMINISTRATION OF F

TOSE. *(Ger.)* Grunst, J.; Dietz, G.; Wicklmayr
Motz, S.; Eisenburg, J.; Mehnert, H.; Hepp, K.
(I. Med. Klinik, Univ. Munchen, Germany). *Vehr*
Dtsch. Ges. Inn. Med. 80:487-491, 1974.

Uric acid concentrations were measured in the h
vein and arterial and peripheral venous blood i
normal subjects who had fasted for 15 hr before
ing, and after an i.v. infusion of a 10% fructo
solution. After a 30 min control period, 10 g
fructose was infused in the first five min and
0.5 g/kg/hr. Liver blood flow was measured wit
^{135}Xe inhalation technique; fructose, glucose,
phate, lactate, and pyruvate concentrations wer
termined every 10 min; and, in some cases, rena
cretion of uric acid was studied. Arterial fru
concentrations reached a peak of about 3 mM fiv
after infusion was begun and then decreased to

ncentration in the hepatic vein was about 1 mM
 The uric acid concentration in the hepatic
ncreased immediately after fructose infusion
gun, reached a peak after 20-30 min, and then
 to decrease. Arterial concentrations of uric
emained essentially unchanged, as did uric acid
 in peripheral venous blood. Liver blood flow
sed from 85.2 to about 100 ml/100 g liver/min
fructose infusion and then decreased again to
itial value. Fructose infusion increased uric
roduction, obtained by multiplying the differ-
n uric acid concentrations between arterial
and that from the hepatic vein by liver blood
about 8-fold (from 0.07 to 0.6 mg/100 g liver/
ithin 10-20 min. After administration of fruc-
the lactate concentration increased in blood
e hepatic vein, reaching 2.5 mM in the arter-
od, a level that would be expected to have an
 on renal uric acid excretion. During fruc-
fusion, uric acid excretion increased to about
the basal values. It is suggested that ATP,
rdinarily inhibits 5-nucleotidases, is utilized
hexokinase-catalyzed phosphorylation of fruc-
 fructose-1-phosphate. Elimination of this
ion increases the breakdown of nucleotides,
ng in increased uric acid synthesis.

UDP GLUCURONYLTRANSFERASE AND PHENOLSULF-
OTRANSFERASE FROM RAT LIVER IN VIVO AND
O--IV. SPECIES DIFFERENCES IN HARMOL CONJU-
AND ELIMINATION IN BILE AND URINE IN VIVO.

 Mulder, G. J.; Bleeker, B. (Dept. Pharmacol-
ate Univ. Groningen, Groningen, The Nether-
 Biochem. Pharmacol. 24(16):1481-1484, 1975.

conjugation and the subsequent elimination of
sulfate and harmol-glucuronide were studied
 Swiss mice, guinea pigs, rabbits, rats and
The cystic duct from the gallbladder was
, and the bile duct and (in some cases) the
gularis externa and urethra were cannulated.
d urine were collected fractionally during the
llowing the i.v. injection of harmol
kg); in the mice and rabbits, urine was coll-
rom the bladder at the end of the experiment
than in fractions during the experiment.
as no correlation between the rate of bile
ion and the biliary excretion of the harmol
tes, nor between the rate of urine production
 urinary excretion of the conjugates. The
and guinea pig nearly exclusively conjugated
mol with glucuronate, whereas the cat predom-
 synthesized the sulfate conjugate. The mouse
 synthesized both conjugates at high rates,
se producing more of the glucuronide conju-
d the rat producing more of the sulfate
te. In all species studied, about 21% of the
d harmol was excreted in the urine in conju-
orm. In the rabbit, about 9% of the injected
s excreted in the bile, while in the other
 about 33-58% of the injected dose was ex-
in the bile. Except for the rabbit, most of
ected harmol was excreted in the bile, harmol-
nide being excreted predominantly in the bile
bbit being an exception) and the harmol-
 being excreted to a large extent in the

urine. In most species, the biliary excretion of the harmol conjugates occurred during the first 30 min after injection; in the cat, biliary excretion of harmol occurred during the first 60 min. The data suggest that biliary excretion requires a high liver concentration of the relevant compound for a high excretory rate.

6835 RATE-LIMITING FACTORS IN THE OXIDATION OF ETHANOL BY ISOLATED RAT LIVER CELLS. *(Eng).*

Meijer, A. J.; Van Woerkom, G. M.; Williamson, J. R.; Tager, J. M. (Lab. Biochemistry, Univ. Amsterdam, Plantage Muidergracht 12, Amsterdam, The Netherlands). *Biochem. J.* 150(2):205-209, 1975.

To determine whether the rate-determining factor during ethanol oxidation is the activity of the shuttles or flux through the phosphorylating electron-transport chain, ethanol oxidation by liver cells isolated from starved (24 hr) and *ad libitum*-fed male Sprague-Dawley rats was studied. Ethanol uptake and oxidation were measured in the presence of malate, DL-cycloserine, carbonyl cyanide *p*-trifluoromethoxyphenylhydrazone, and amytal. Malate caused a marked cycloserine-sensitive stimulation of ethanol oxidation in the liver cells from the starved rats and a small increase in glucose production; oxygen uptake was not increased. The addition of carbonyl cyanide *p*-trifluoromethoxyphenylhydrazone to the cells from the starved rats did not increase ethanol consumption, unless the cells were preincubated with lactate and guinolinate. At carbonyl cyanide *p*-trifluoromethoxyphenylhydrazone concentrations greater than 6.6 μM, ethanol consumption was inhibited and there was a concomitant decrease in respiratory rate and an increased leakage of lactate dehydrogenase into the medium. Lactate stimulation of ethanol oxidation was shown to have two components: stimulation by an increased energy demand owing to glucose synthesis which was sensitive to quinolate; stimulation by increased activity of the malate-aspartate cycle because of increased malate and aspartate concentrations, which was insensitive to quinolate. The addition of dehydroxyacetone to the liver cells from the starved animals stimulated ethanol uptake by 45% and increased the glycerol 3-phosphate content three-fold. Amytal (1-4 mM) inhibited ethanol uptake by 50% and caused a progressive switch of dehydroxyacetone metabolism from glucose to lactate formation. The rate of ethanol consumption by the cells from the fed rats was two-fold greater than that observed in the cells from the starved rats, and the cellular concentrations of malate, aspartate, and glycerol 3-phosphate were much higher in the former than in the latter. Malate stimulated ethanol consumption in the fed rats, but this effect was inhibited by quinolinate. Carbonyl cyanide *p*-trifluoromethoxyphenylhydrazone also stimulated ethanol oxidation in the fed rats, but malate was ineffective. Thus, in the cells from the starved rats, the transfer of reducing equivalents from the cytosol to the mitochondria appears to be regulated by the intracellular concentrations of the intermediates of the malate-aspartate and glycerol 3-phosphate cycles, as well as by flux through the respiratory chain.

6836 CHANGES IN SOME CLINICAL CHEMICAL PARAMETERS IN THE SERUM OF SUBJECTS GIVEN ALCOHOL FOLLOWING CONTINUOUS INHALATION OF CARBON DISULFIDE. *(Ger.)* Freundt, K. J.; Lieberwirth, H. (Institut Toxikologie und Pharmakologie, Universitat, D-8700 Wurzburg, Koellikerstrasse 2, Germany). *Zentralbl. Arbeitsmed.* 24(9):266-271, 1974.

Serum cholesterol, Ca^{++}, inorganic phosphate, total bilirubin, albumin, total protein, uric acid, nonprotein nitrogen, glucose, LDH, alkaline phosphatase, and SGOT were measured in 11 normal males, aged 20-32 yr and weighing 64-98 kg, who were exposed to carbon disulfide (CS_2) concentrations of 20, 40, or 80 ppm for eight-hr periods once or on two or five consecutive days. These subjects were fed a standard diet and, to maintain a blood alcohol level of approximately 0.07%, 0.57 mg/kg ethanol in 3.01 ml/kg orange juice at the beginning of the test period and 0.047 ml/kg ethanol in 0.18 mg/kg orange juice every 15 min thereafter for eight hr. Controls consisted of subjects fed the same diet who were not exposed to CS_2 or who were exposed to 20 ppm CS_2 but given no alcohol. Total serum bilirubin increased and blood glucose decreased in subjects given alcohol and exposed to 80 ppm CS_2 for eight hr. Total serum bilirubin, albumin, total protein, uric acid, and alkaline phosphatase increased in subjects given alcohol 16-24 hr after an eight-hr exposure to 20 ppm CS_2. When subjects were exposed to 20 ppm CS_2 for eight-hr periods on each of five consecutive days and given alcohol over the last eight-hr exposure period, total serum bilirubin increased and glucose and SGOT decreased. Serum glucose concentrations also decreased in controls who were given alcohol but were not exposed to CS_2. All of these changes were significant ($0.1 < p < 0.05$), but values were above the normal range in only a few cases. No changes occurred in any of the parameters measured when subjects were exposed for 8 hr to 40 ppm CS_2 and given alcohol or when they were exposed to 20 ppm CS_2 for 8 hr without alcohol. These findings indicate that occupational exposure to CS_2 concentrations of 20 ppm or less in subjects who drink moderate amounts of alcohol causes no pronounced changes in any metabolic reactions routinely measured.

6837 THE EFFECT OF ETHYL ALCOHOL ON HEME AND PORPHYRIN SYNTHESIS IN RAT LIVER. *(Ger.)* Held, H. (Med. Univ. Klinik, Tubingen, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:481-484, 1974.

Administration of 2 g/kg ethanol p.o. to rats which had been fasted for 48 hr doubled or tripled Δ-aminolevulinic acid (ALS) synthetase activities within three hr but had no effect on ALS dehydratase or drug-metabolizing decarboxylase, as measured by hexobarbital degradation and the cytochrome P-450 concentration. The ALS synthetase activity returned to normal 6 hr after administration of ethanol. From eight to 24 hr after administration of ethanol, the total porphyrin concentration in the livers of these rats was increased significantly to a maximum of 75% of the initial value. As anticipated, in fasting rats given 80 mg/kg phenobarbital 48 hr before administration of ethanol, hexobarbital decarboxylase was induced and cytochrome P-450 concentrations doubled or tripled. The increase in ALS synthetase activities which occurred after administration of ethanol in phenobarbital-treated rats was greater than that in rats given ethanol alone and reached as high as 10 times the original values. However, 16 hr after injection of phenobarbital, enzyme activities had returned to their initial levels. These findings suggest that phenobarbital sensitizes the liver to ethanol. The induction of ALS synthetase cannot be due to changes in cytochrome P-450 concentrations in the hepatocytes but is probably due to changes in intermediary metabolism in the liver.

6838 EFFECT OF CHRONIC ETHANOL INGESTION ON FATTY ACID OXIDATION BY HEPATIC MITOCHONDRIA. *(E.)* Cederbaum, A. I.; Lieber, C. S.; Beattie, D. S.; Rubin, E. (Mount Sinai Sch. Medicine, City Univ. New York, N.Y. 10029). *J. Biol. Chem.* 250(13): 5122-5129, 1975.

To further investigate the pathogenesis of fatty liver, the effect of chronic ethanol ingestion was studied in liver mitochondria isolated from male Sprague-Dawley rats. Oxygen uptake with various fatty acids as substrates was measured. State 3 uptake was depressed to a greater extent (75.80 and 54.2 natoms/min/mg of protein for control and ethanol-treated, resp.) than State 4 respiration (20.93 and 18.0 natoms/min/mg of protein, resp.), using 15 µM of palmitoyl-l-carnitine as a substrate. Values with other fatty acids as substrates were similar. CO_2 production from palmitate was reduced 37% in mitochondria from ethanol-fed rats, comparable to the 32% decrease seen in State 3 oxygen consumption. CO_2 production from octanoate was reduced 20% by ethanol feeding, similar to the 17% decrease in State 3 oxygen consumption. Palmitoyl coenzyme A (CoA) synthetase activity was not affected by ethanol feeding. Carnitine palmitoyltransferase activity was stimulated 30%. Ethanol feeding had no effect on the endogenous rate of ketone body production. However, the addition of palmitoyl-l-carnitine or palmitate increased ketone body production about 4-fold. Fatty acid oxidation under anaerobic conditions, with the use of artificial electron transport acceptors to reoxidize NADPH, was studied. In the presence of fluorocitrate, ketogenesis and formazan production were increased by chronic ethanol feeding. It is concluded that chronic consumption of ethanol leads to persistent impairment of mitochondrial oxidation of fatty acids to CO_2, even though oxidation of fatty acids to acetyl-CoA is not decreased.

6839 EFFECT OF ACETALDEHYDE ON FATTY ACID OXIDATION AND KETOGENESIS BY HEPATIC MITOCHONDRIA. *(E.)* Cederbaum, A. I.; Lieber, C. S.; Rubin, E. (Mount Sinai Sch. Medicine, City Univ. New York, N.Y. 10029). *Arch. Biochem. Biophys.* 169(1): 29-41, 1975.

To determine whether acetaldehyde may play a role in ethanol-induced steatosis, the effects of acetaldehyde on fatty acid oxidation by isolated rat liver mitochondria were studied. The mitochondria were incubated with 0.6 to 12.0 mM of acetaldehyde and the effects on mitochondrial oxygen consumption, CO_2

production, ketone body production, acetyl CoA content, and palmitoyl-CoA synthetase and carnitine-palmitoyltransferase activity were determined. State 3 (coupled) oxygen consumption was inhibited by acetaldehyde in concentrations as low as 0.6 mM, while state 4 (resting) respiration was significantly inhibited only by 12 mM of acetaldehyde. Ethanol (12, 40 and 80 mM) had no effect on oxygen consumption. Acetaldehyde also caused a decrease in the respiratory control ratio associated with the oxidation of palmitoyl-1-carnitine and palmitoyl CoA; ethanol had no such effect. Acetaldehyde depressed ketone body production as well as the content of acetyl CoA during palmitoyl-l-carnitine oxidation, acetaldehyde being considerably more inhibitory toward fatty acid oxidation than was acetate. Oxygen uptake was depressed by acetaldehyde to a slightly, but consistently, greater extent in the absence of fluorocitrate than in its presence. The formation of CO_2 from palmitate was strikingly reduced by acetaldehyde; CO_2 production was much more sensitive to inhibition by acetaldehyde than was oxygen consumption. The inhibitory effect of acetate on CO_2 production was considerably less than that of acetaldehyde, and the oxidation of acetate to CO_2 was depressed by acetaldehyde. The results suggest that acetaldehyde-induced inhibition is not mediated by acetate, and that the inhibition of fatty acid oxidation is not due to any effect on the activation or translocation of fatty acids into the mitochondria. Acetaldehyde appears to inhibit β-oxidation, citric acid cycle activity, and the respiratory-phosphorylation chain. Neither the activities of palymitoyl CoA synthetase nor carnitine palmitoyltransferase appear to be rate limiting for fatty acid oxidation. The inhibition of fatty acid oxidation by metabolites of ethanol oxidation (acetaldehyde) may contribute to the steatosis observed after chronic ethanol treatment.

6840 ACETALDEHYDE OXIDATION BY HEPATIC MITOCHONDRIA: DECREASE AFTER CHRONIC ETHANOL CONSUMPTION.

(E.) Hasumura, Y.; Teschke, R.; Lieber, C. S. (Veterans Admin. Hosp., Bronx, N.Y. 10468). *Science* 189(4204):727-729, 1975.

The effects of chronic ethanol feeding (36% of the total calories in a nutritionally adequate diet for 4 to 5 wk) on the capacity of intact liver mitochondria to oxidize acetaldehyde and the activity of aldehyde dehydrogenase in disrupted mitochondria were studied in pair-fed female Sprague-Dawley rats. Chronic ethanol consumption resulted in a significant reduction in the rate of acetaldehyde metabolism by intact mitochondria *in vitro*. This was associated with decreased mitochondrial respiration with acetaldehyde as substrate. The addition of fatty acids and other substrates for NAD-linked dehydrogenases in mitochondrial respiration further decreased the rate of acetaldehyde oxidation. In contrast, in disrupted mitochondria supplied with NAD, the activity of NAD-dependent aldehyde dehydrogenase was higher in the ethanol-fed rats than in the linked controls. The activity of glutamate dehydrogenase remained unchanged, however. The data suggest that elevated blood acetaldehyde resulting from enhanced ethanol metabolism or decreased disposition may impair mitochondrial functions, including the capacity to oxidize acetaldehyde. This, in turn, will elevate the acetaldehyde concentration in the blood even further, which may then perpetuate injury not only in the liver but possibly also in the heart and brain.

6841 EFFECTS OF CHRONIC ETHANOL ADMINISTRATION IN THE RAT: RELATIVE DEPENDENCY ON DIETARY LIPIDS -- I. INDUCTION OF HEPATIC DRUG-METABOLIZING ENZYMES IN VITRO.

(E.) Joly, J. G.; Hetu, C. (Hopital Saint-Luc, 1058 St. Denis St., Montreal, Quebec, Canada H2X-3J4). *Biochem. Pharmacol.* 24(16):1475-1480, 1975.

The importance of dietary lipid, daily ethanol intake, and undernutrition on the effects of ethanol on drug-metabolizing activities *in vitro* was studied in female Sprague-Dawley rats. The animals were pair-fed for 5 to 7 wk on high- or low-fat diets containing 5% or 6% (w/v) ethanol, or were fed *ad libitum* or were given restricted hypocaloric diets for 21 and 28 days, resp. The livers were then removed and the liver microsomes were tested *in vitro* for microsomal demethylation activity, NADPH-cytochrome c reductase, MEOS, protein, and cytochrome P-450. Ethanol given as a 5% solution with high amounts of dietary fat increased cytochrome P-450, the activities of NADPH-cytochrome P-450 reductase, benzphetamine demethylation, aniline hydroxylation, and MEOS. When 5% ethanol was given with a low fat diet, the increases in cytochrome P-450 and P-450 reductase were reduced, but the other enzyme activities were increased to the same extent as seen with the high fat diet. When ethanol was administered as a 6% solution with a low fat diet, caloric deficiency was observed and there was no significant induction of any enzymic parameter except aniline hydroxylation. When 6% ethanol was given with a high fat diet, however, cytochrome P-450 and P-450 reductase, but not MEOS, were increased despite the caloric deficiency. Ingestion of 6% ethanol with the high fat diet resulted in a negligible weight gain. In the animals fed the hypocaloric diet *ad libitum*, growth was impaired by 66% and the liver cytochrome P-450 level was increased, but there were no other significant changes; the caloric intake in these animals was similar to that in the 5% ethanol-high fat and 6% ethanol-low fat groups. In the animals fed the restricted hypocaloric diet, significant increases in cytochrome P-450, NADPH-cytochrome P-450 reductase, and benzphetamine demethylation were observed, and aniline hydroxylation was nonsignificantly elevated; the caloric intake in these animals was similar to that in the 6% ethanol-high fat group. The data indicate that the induction of drug-metabolizing enzymes by ethanol is partially dependent on dietary lipids, as well as on the amounts of ethanol ingested and on the nutritional status of the animal.

6842 ALCOHOL-INDUCED TESTICULAR ATROPHY: AN EXPERIMENTAL MODEL FOR HYPOGONADISM OCCURRING IN CHRONIC ALCOHOLIC MEN.

(E.) Van Thiel, D. H.; Gavaler, J. S.; Lester, R.; Goodman, M. D. (Univ. Pittsburgh Sch. Medicine, Pittsburgh, Pa. 15261). *Gastroenterology* 69(2):326-332, 1975.

The effect of chronic alcohol ingestion (*via* a liquid diet in which ethanol accounted for 36% of the total calories) on testicular growth, development and function was studied in male Wistar rats aged 20 days at the start of the experiment. The ethanol-fed animals and a group of pair-fed controls were killed at 61 days of age and the liver, testes, prostate gland, seminal vesicles and pituitary glands were weighed and examined histologically. The plasma testosterone and serum total bilirubin, alkaline phosphatase, and glutamic pyruvic transaminase levels were also determined. *Ad libitum*-fed controls gained weight steadily until 60 days of age, and the testes, prostate and seminal vesicles increased in mass until reaching adult size and histologic appearance at 40 days of age; the plasma testosterone concentrations reached adult levels at 40 to 50 days. At death, the ethanol-fed rats showed a significant reduction in testicular mass relative to body weight compared to their pair-fed controls, although the absolute testicular mass of the latter was reduced compared with that of the *ad libitum*-fed controls. The reduction in testicular mass in the alcohol-fed rats was due primarily to a reduction in the mean seminiferous tubular diameter and the amount of germinal epithelium within the tubules. Leydig cell function was also disturbed in the ethanol-treated animals; there was a significant reduction in the ventral prostate and seminal vesicle mass relative to body mass, and the histologic appearance of the seminal vesicles and ventral prostate was one of complete androgen deprivation. In addition, the plasma testosterone concentrations in the ethanol-fed rats were significantly reduced in comparison with the pair-fed and *ad libitum*-fed controls. However, the pituitaries of the three groups showed no apparent histologic differences. Despite the fact that the body mass was significantly reduced in the ethanol-fed rats compared with the pair-fed controls, the liver weight and ratio of liver mass to body mass were increased in the former as compared with the latter. Although fatty metamorphosis was present in the livers of the ethanol-fed rats, there was no histologic evidence of acute inflammation, necrosis or portal fibrosis, and liver function tests were within normal limits. The data support the view that ethanol is a primary testicular toxin.

6843 EFFECT OF LIFETIME EXPOSURE TO AFLATOXIN B_1 IN RATS.

(E.) Ward, J. M.; Sontag, J. M.; Weisburger, E. K.; Brown, C. A. (Natl. Cancer Inst., Bethesda, Maryland 20014). *J. Natl. Cancer Inst.* 55(1):107-113, 1975.

The effects on rats of exposure to aflatoxin B_1 (AFB_1) through transplacental and milk metabolites, followed by lifelong dietary exposure, was studied. Pregnant F344 rats were fed a diet containing 2 ppm AFB_1 throughout gestation and lactation, and the waned offspring were fed the same diet until they died. For comparison, this diet was also administered to another group of rats beginning at age six or seven weeks. The survival of male rats was significantly shorter than that of females of both groups, i.e., 45.6 *versus* 61.6 weeks in the group exposed from conception and 50.2 *versus* 63.1 weeks in the group exposed from six or seven weeks. The major causes of death were rupture of a hemorrhagic liver tumor and hemoperitoneum or pulmonary metastases with or without hemothorax. Histologically, the hemorrhagic liver tumors were hemangiosarcomas composed of poorly differentiated cells resembling endothelial cells. Nodules of hyperplasic liver cells sometimes became quite large (> 1.5 cm), and two were successfully transplanted. The hemangiosarcomas rapidly induced pulmonary metastatses upon s.c. transplantation into weanling and young adult rats, but did not elevate serum α-fetoprotein levels in recipients. After 20 serial passages, the morphology of the tumor resembled that of the original primary liver tumor. Colon tumors also appeared in more than 20% of the rats exposed *in utero* or given AFB_1 at six or seven weeks. These tumors were primarily polyploid neoplasms in the descending colon. A few rats had tumors of the kidney, oral cavity, and hematopoietic system. These results indicate that AFB_1 should be considered a colonic as well as a hepatic carcinogen.

6844 DIVERSE EFFECTS OF ANTIOXIDANTS ON CARBON TETRACHLORIDE HEPATOTOXICITY.

(E.) De Ferreyra, E. C.; Castro, J. A.; Gomez, M. I. D.; D'Acosta, N.; De Castro, C. R.; De Fenos, O. M. (Laboratorio de Quimica Bio-Toxicologia, CITEFA, Zufriategui y Varela, Villa Martelli, Pica. de Buenos Aires, Argentina). *Toxicol. Appl. Pharmacol.* 32(3):504-512, 1975.

The diverse effects of *in vitro* antioxidants on carbon tetrachloride hepatotoxicity were investigated in Sprague-Dawley rats. The prior treatment of animals with oil solution of α-tocopherol acetate did not have an effect on CCl_4 concentrations in liver when the hepatotoxin was given p.o. or i.p. and determinations were performed at intervals up to 3 hr. Similarly, the content of CCl_4 in livers of rats pretreated with a saline solution of 25 mg/kg promethazine was not significantly different from that of the untreated animals given CCl_4 i.p. Oil suspensions of 600 mg/kg *N*,*N*'-diphenyl-*p*-phenylenediamine were not able to modify the amount of CCl_4 reaching the liver 1, 3, or 6 hr after oral administration of CCl_4. Water suspensions were able to significantly modify the 1-hr concentrations in liver of CCl_4 given p.o. Significant decreases were found in CCl_4 concentrations in the liver when water suspensions of *N*,*N*'-diphenyl-*p*-phenylenediamine were used and CCl_4 was given i.p. The effect was observed at 3 hr but was more pronounced at 6 hr. Oil suspensions did not produce significant differences in CCl_4 concentrations in liver at 1 or 3 hr in rats given CCl_4 i.p. α-Tocopherol acetate did not modify the extent of the irreversible binding of ^{14}C to microsomal lipids, but *N*,*N*'-diphenyl-*p*-phenylenediamine decreased it significantly. α-Tocopherol acetate, *N*,*N*'-diphenyl-*p*-phenylenediamine given either as oil or water suspensions, as well as promethazine, were not able to prevent the CCl_4-induced lipid peroxidation at 40 min or 3 hr after CCl_4 administration. These results weaken the value of previous findings with antioxidants which were used to support the lipid peroxidation theory of CCl_4 hepatotoxicity.

6845 EFFECT OF 17α-ETHINYLESTRADIOL ON BILIARY EXCRETION OF BILE ACIDS.

(E.) Watanabe, H. (Drug Res. Lab., Dep. Natl. Health Welfare, Ottawa, Canada). *Biochim. Biophys. Acta* 399(1):79-84, 1975.

The effects of 17α-ethinylestradiol on bile acid excretion and metabolism were studied in female Wistar rats. The common bile duct was cannulated, and for 3 days prior to bile collection all animals were fed cholestyramine (3% added to a ground fox cube diet). 17α-Ethinylestradiol in 10% ethanolic saline was administered by oral intubation daily for 4 days at a dose level of 1, 10, 25, 50, 100 or 250 μg; controls received ethanolic saline. In another group of cholestyramine-treated and untreated rats, 17α-ethinylestradiol was administrred for 1 to 10 days at a dose level of 500 μg. Eighteen hr after the last dose of steroid, bile samples were collected over a 3-hr period. The bile salts were extracted, hydrolyzed, methylated, and analyzed by gas-liquid chromatography. The ratio of cholate to chenodeoxycholate was progressively diminished by estrogen treatment up to 25 μg. At dose levels between 50 and 250 μg, there were no further increases in the chenodeoxycholate levels nor further declines in the cholate:chenodeoxycholate ratio. There was a tendency towards a decrease in cholate levels in this dose range, the reduction also being apparent in animals treated with 500 μg of estrogen. Prolonged treatment with 500 μg/day of 17α-ethinylestradiol produced a progressive reduction in the excretory rate of both bile acids in cholestyramine-treated and untreated animals. The effects of various other estrogens were similar to those of 17α-ethinylestradiol while various progestins were without effect. The responses were similar following p.o. and s.c. treatment. The results indicate that 17α-ethinylestradiol in low doses stimulates chenodeoxycholate excretion, whereas in high doses it reduces cholate excretion.

6846 CAERULEIN EFFECT ON THE BILIARY EXCRETION OF COLORANTS.

(E.) Angelucci, L.; Linari, G.; Baldieri, M. (Inst. Pharmacol. Pharmacognosy, Univ. Rome, Italy). *Pharmacol. Res. Commun.* 7(4): 311-322, 1975.

The effects of cerulein (15-50 ng/kg/min, i.v.) on the biliary excretion and plasma concentration of BSP (200-600 or 1000 μg/kg/min, i.v.) and rose bengal (RB, 100-175 μg/kg/min, i.v.) were studied in lightly anesthetized white Leghorn-Rhode Island chickens. In some experiments both hepatic bile ducts were cannulated so that the enterohepatic circulation of bile salts was totally interrupted; in other experiments, only the left duct was cannulated. Also, in some experiments, Na taurocholate was given by continuous i.v. infusion (200 μg/kg/min) throughout. Cerulein stimulated bile flow during BSP (200-600 μg/kg/min) administration in the absence of an enterohepatic circulation of bile salts. Bile salt output and biliary BSP output were unaffected. When Na taurocholate was infused with BSP under similar conditions, cerulein stimulated choleresis and increased the output and concentration of bile salts. The biliary excretion of BSP was unaffected, as were plasma levels of the colorant. In animals receiving BSP at a rate of 1000 μg/kg/min, however, cerulein did stimulate the biliary excretion of the colorant and also affected its plasma levels. During BSP administration (500 μg/kg/min) in the presence of a partial enterohepatic circulation of bile salts, cerulein (25 ng/kg/min) produced an intense total choleresis, an increase in bile salts output and concentration, and increases in the biliary excretion and plasma levels of BSP. Similar results were found during the administration of RB. The results indicate that cerulein increased the biliary excretion of BSP and RB only when the colorants were infused at rates higher than the maximum liver transport capacity (Tm) and when some bile salt was available for secretion. It appears that cerulein, by increasing choleresis, reduces the limiting factor to the excretion of colorant into bile under liver Tm conditions, i.e., its concentration in the canalicular bile.

6847 MORPHOLOGICAL ASPECTS OF TREATING PATIENTS WITH CHOLECYSTITIS WITH CHENODEOXYCHOLIC ACID.

(Ger.) Leuschner, U. (Cent. Intern. Med., Johann Wolfgang Goethe Univ., Frankfurt/Main, Germany). *Z. Gastroenterol.* 13:309-313, 1975.

To determine whether therapeutic doses of chenodeoxycholic acid are hepatotoxic, 20 mg/kg doses were administered p.o to rats for 5 to 60 days. The animals were then sacrificed, and the entire gastrointestinal tract was examined by light and electron microscopy; findings were compared to those from untreated controls. In two of the five rats examined, bile capillaries were dilated and contained lipid-like material; the villi had completely disappeared after 20 days of treatment. After 60 days of treatment, light vacuoles were present in hepatocyte cytoplasm along intercellular spaces and right below the outer cell membranes. Digitate or cystic dilatations of the intercellular space were detected which, in some cases, resembled bile capillaries. Since the contents of cytoplasmic vacuoles resembled those of the intercellular cysts, it is suggested that these structures are inclusion vacuoles arising from invagination of the outer cell membrane and that they contain substances normally secreted in the bile. These findings demonstrate that doses of chenodeoxycholic acid, similar to those given to patients with cholesterol gallstones, are hepatotoxic to rats although chenodeoxycholic acid and its derivative, lithocholic acid, may be readily detoxified by 6β-hydroxylation. Abnormalities found in the jejunal epithelium consisted of deposits of fat in submembranous vesicles and supranuclear deposits of highly osmiophilic, lipid-like substances. Many cells were swollen, and microvilli were broader and coarser than in untreated controls. In rats given chenodeoxycholic acid for 60 days, a decrease occurred in the number of villi and in their length, and the terminal reticulum was dispersed in some cells found in the ileum. These changes might be a manifestation of disorders in the electrolyte and water balance.

6848 TOXICITY OF CHENODEOXYCHOLIC ACID IN THE RHESUS MONKEY.

(E.) Dyrszka, H.; Chen, T.; Salen, G.; Mosbach, E. H. (New Jersey Medical Sch., Newark, N.J.). *Gastroenterology* 69(2):333-337, 1975.

To determine the mechanism of toxicity of chenodeoxycholic acid, the bile acid was administered daily (10, 40 or 100 mg/kg, p.o.) for 1 mo to male and female rhesus monkeys; control animals were given placebo.

The animals were killed after 33 days of bile acid administration or 9 days after the cessation of treatment. Changes in the blood and serum values, biliary lipids, and liver tissue were recorded. The serum leucine aminopeptidase values increased in proportion to the dose of chenodeoxycholic acid administered. The total blood count, SGOT, serum bilirubin, serum total protein and albumin, serum cholesterol, blood urea nitrogen, creatinine, electrolytes and blood glucose levels remained within normal limits in all treatment groups. Bile acid administration caused a marked decrease in the proportion of cholic acid and deoxycholic acid in the bile, and chenodeoxycholic acid became the major component of the biliary acids. The proportion of lithocholic acid also increased seven- to ten-fold; in the 40 and 100 mg/kg groups it exceeded the amount of cholic acid and deoxycholic acid. There were no significant changes in the biliary phospholipid or cholesterol concentrations. The bile acid composition had markedly improved in the animals killed 9 days after cessation of bile acid treatment. Liver biopsies obtained before treatment and at necropsy showed no significant histological changes. The data indicate that the hepatic toxicity which developed following the administration of chenodeoxycholic acid may result from an inability to metabolize chenodeoxycholic acid itself or its bacterial metabolite, lithocholic acid.

6849 CIRRHOSIS OF CHOLINE DEFICIENCY IN THE RHESUS MONKEY. POSSIBLE ROLE OF DIETARY CHOLESTEROL.

(E.) Patek, A. J., Jr.; Bowry, S.; Hayes, K. C. (Veteran's Administration Hosp., Boston, Mass. 02130). *Proc. Soc. Exp. Biol. Med.* 148(2):370-374, 1975.

The production of cirrhosis by a choline-deficient diet lacking peanut meal and cholesterol was studied in adult rhesus monkeys. The monkeys were fed a basic choline-deficient diet, the same diet with added choline, or commercial chow. After 14 months, the animals which had been maintained on the basic choline-deficient diet were divided into two groups; one group received the original diet, and the second received a cholesterol supplement comprising 2% of the diet. The experiment was continued for a total of 31 months. Venous blood samples and needle biopsies of the liver were examined at 3-month intervals. Growth rates were similar in all groups, and the blood chemistries were normal except in two animals which developed cirrhosis, and in the protein- and choline-deficient animals; the latter developed a moderate anemia and hypoalbuminemia. Patch alopecia developed in several animals fed the cholesterol supplement. The livers of the animals fed the choline-deficient diet and the choline-supplemented diet showed slight fatty changes, fine vacuolation, and ballooning of the hepatocytes. A sharp increase in fat was seen in the livers of the animals fed supplemental cholesterol. Cirrhosis developed in one animal after 26 months on the choline-deficient diet and in another monkey after 2 months on the cholesterol-supplemented diet. Electron microscopy showed depletion of cytoplasmic constituents in the animals fed the low-protein diets, but no other changes. The data indicate that the rhesus monkey can develop choline-deficiency cirrhosis, although it is less susceptible than the rat. The addition of cholesterol to the diet appears to exert an hepatotoxic effect.

6850 ULTRASTRUCTURAL STUDIES OF THE HEPATOCYTES AFTER CHRONIC EXPOSURE TO LOW LEVELS OF HALOTHANE.

(E.) Chang, L. W.; Dudley, A. W.; Lee, J. K.; Katz, J. (Dept. Pathology, Univ Wisconsin, Madison, Wis. 53706). *Exp. Mol. Pathol.* 23(1):35-42, 1975.

Electron microscopy (EM) was used to study the pathological effects on the liver of long-term, chronic exposure to low levels of halothane. Adult Sprague-Dawley rats of both sexes were used. Halothane exposures were 10 ppm, 8 hr/day, five days/wk for 8 wk and 500 ppm, 8 hr/day, five days/wk for 4 wk. EM study of the low dose liver tissue showed an increase in matrical density of the mitochondria and some C-shaped transformation. There was also an accumulation of floccular, electron-dense material around the rough endoplasmic reticulum. At the higher dose, severe dilation of bile canaliculi was observed with a flattening and loss of microvilli; extrusion of cellular debris with peribiliary accumulation of electron-dense bodies, presumed to be lysosomes, was also evident. Occasionally, large, membrane-limited floccular bodies containing remnants of cytoplasmic material (focal cytoplasmic degradation) were observed. Halothane was concluded to have a direct hepatotoxic effect.

6851 METHIONINE-INDUCED HEPATIC COMA IN DOGS.

(E.) Merino, G. E.; Jetzer, T.; Doizaki, W. M. D.; Najarian, J. S. (Univ. Minnesota Hosp., Minneapolis, Minn.). *Am. J. Surg.* 130:41-46, 1975.

The relation between p.o. methionine doses and blood ammonia and methanethiol levels was analyzed. Mongrel dogs (19) were given portacaval shunts and fed a daily diet containing 25 g of protein and 40 g of lipids. Fasting ammonia level was measured daily before feeding, and liver enzyme and electrolyte levels were measured every third day. Of the dogs, 11 were fed methionine (25 g every 4 hr) *via* nasogastric tube as a 50% aqueous suspension until the animal became comatose. The remaining 8 plus 8 nonshunted dogs served as controls. Ammonia values were monitored every 4 hr during methionine feeding, and blood methionine levels were determined when coma ensued. None of the dogs showed encephalopathy up to the 21st postoperative day, regardless of ammonia level. Methionine feeding was begun when fasting ammonia levels reached 250 to 500 μg/100 ml in three dogs, at 500 to 1000 μg/100 ml in two, at 1000 to 1250 μg/100 ml in three, and at 1250 to 1500 μg/100 ml in three. Coma developed in two dogs after five boluses of methionine, in two after four boluses, in three after three boluses, in two after two boluses, and in one after one bolus. Of 10 episodes of deep or very deep coma, three were fatal, and seven other abnormal neurologic conditions were classified as subcoma. Average fasting ammonia levels remained stable around 450 μg/100 ml, and gradually increased to 750 μg/100 ml over 10 days. SGOT and serum alkaline phosphatase levels rose slowly over the 10 days. Lower methionine doses (25 g) could trigger coma in dogs with high ammonia levels (over 1250 μg/100 ml) and doses up to 125 g were needed to induce coma when ammonia levels were under 500 μg/100 ml. In the four dogs that died during coma, the pH and electrolyte values showed metabolic acidosis, hypoxemia, hypoglycemia, hypokalemia, thrombocytopenia, hemolysis, and intravascular coagulation during the terminal stages. Methanethiol blood levels increased proportional to the dose given. A 3-fold increase in ammonia level increased the comatogenicity of methanethiol 100-fold. A dog with an ammonia level of 300 μg/ml required 100 times the methanthiol level of one with an ammonia level of 1200 μg/ml to become comatose. Controls showed no evidence of encephalopathy even after massive doses. Infusion of ammonium ions in controls showed concentrations of 5500 and 9000 mg/100 ml blood corresponded to complete coma. In controls, convulsions and coma were induced by 3 to 5 ml 1:40 methanethiol i.v. in 0.1 M NaOH. After injection of 1 ml methanethiol, 1/5 of the previously determined comatogenic dose of ammonia induced encephalopathy. It is concluded oral methionine is comatogenic in dogs with portacaval shunts and with elevated blood ammonia levels.

6852 SIGNIFICANCE OF LIVER CANALICULAR CHANGES AFTER EXPERIMENTAL BILE DUCT LIGATION. *(E.)*

De Vos, R.; De Wolf-Peeters, C.; Desmet, V.; Bianchi, L.; Rohr, H. P. (Departement Medische Navorsing, Laboratorium voor Histochemie en Cytochemie, Academisch Ziekenhuis St. Raphael, Katholicke Universiteit Leuven, B-300 Leuven, Belgium). *Exp. Mol. Path.* 23(1):12-34, 1975.

A study was undertaken to analyze the canalicular morphological and histochemical changes in the liver after bile duct ligation and to compare these findings with those present in canaliculi found during the perinatal period. Twenty-one adult male Wistar R rats were subjected to bile duct ligation (BDL). The time interval between surgical intervention and sacrifice was 1, 2, 3, 4, 9, 20 or 40 days. One day after BDL there was an immediate, positive alkaline phosphatase reaction in all canaliculi; this activity was limited to the luminal contents; it remained high during the entire experimental period. EM study revealed progressively increasing dilation of the canaliculi, loss of microvilli and invagination and interdigitation of the hepatocellular plasma membranes. There was pericanalicular ectoplasm surrounding most of these canalicular structures, which were strongly widened, swollen and edematous. Morphometry was used to characterize the diffuse canalicular types. The frequency of the four prototypes of canalicular structures varied depending on the duration of the BDL. These four types were briefly described. Canaliculi found in the perinatal liver corresponded to type 3 (inactive) canaliculi of BDL ducts. The data point to an evolution in the morphological appearance of the biliary pole of the hepatocytes after BDL as well as the newly formed canalicular structures.

6853 REVERSIBILITY OF MORPHOLOGICAL CHANGES IN THE LIVER FOLLOWING EXPERIMENTAL BILE DUCT OBSTRUCTION. *(Ger.)*

Schweizer, P.; Reifferscheid, P. (Chirurgische Universitatsklinik, 74 Tubingen, Calwer Strasse 7, Germany). *Z. Kinderchir.* 15(2): 174-187, 1974.

The common bile duct was ligated and excised between the duodenum and the outlet of the cystic duct in two-day-old female swine. Bile flow was then restored four, six, or eight weeks after surgery by performing a cholecystoduodenostomy. Controls consisted of six sham-operated swine. Morphometric analysis of liver sections, determinations of serum bilirubin, serum enzymes (SGOT, SGPT, γ-glutamate transaminase, leucine aminopeptidase, and alkaline phosphatase), and the Quick test, and measurements of portal venous pressure revealed that changes induced by bile duct ligation were reversible if bile flow was restored four to five weeks after ligation. If drainage operations were performed later, the progress of fibrosis could no longer be arrested. After fibrous tissue extended throughout the lobules of the liver, increases in portal venous pressure became irreversible. The transition from reversible to irreversible changes in the liver could be established by the ratio of glutamate transaminase/leucine aminopeptidase: this ratio was 1 in normal animals and larger in swine with changes in the hepatic lobules. Much less fibrosis and less severe portal hypertension were found in swine with extensive adhesions between the small intestine and the porta hepatis than in swine who did not develop adhesions. Biochemical findings normalized four weeks after bile duct ligation in swine with such adhesions. It is suggested that this is due to drainage of bile through lymphatic anastomoses between the hepatoduodenal ligament and the small intestine. This hypothesis is supported by the appearance of spots of bile on the cut surface when adhesions were separated.

6854 EFFECT OF PORTACAVAL SHUNT AND ARTERIALIZATION OF THE LIVER ON BILE ACID METABOLISM. *(E.)*

Horak, W.; Gangl, A.; Funovics, J.; Grabner, G. (Dept. Gastroenterology, Univ. Vienna, Vienna, Austria). *Gastroenterology* 69(2):338-341, 1975.

The clearance of endogenous bile acids which normally reach the liver *via* the portal vein was studied in mongrel dogs subjected to portacaval end-to-side shunt with and without arterialization of the hepatic portal venous bed. Blood was obtained from the portal and peripheral veins before surgery, postoperatively, and at two-wk intervals thereafter for determination of bile acids and routine laboratory tests. Ten wk after surgery, liver biopsies were obtained and the dogs were killed and the livers weighed. Portacaval shunting caused a 75% decrease in the total hepatic blood flow; this was prevented by arterialization of the shunted liver. Body weight remained constant in all animals, but the liver weight was significantly reduced in the animals subjected to portacaval shunt. The liver mass in the arterialized dogs did not differ significantly from that in the normal controls or in the animals subjected to portacaval shunt only. Serum bilirubin levels remained constant in all animals. However, SGOT was increased in the shunted but not in the arterialized animals, and the serum ammonia and bile acid concentrations were increased postoperatively in both groups, but to a significantly greater extent in the shunted animals. Total serum cholesterol declined significantly in both groups after surgery. Clearance was significantly reduced in the shunted dogs, but remained at normal values in the arterialized dogs. There was a linear correlation between hepatic bile acid clearance and total liver blood flow. The data indicate that portacaval shunt combined with arterialization of the liver is associated with less severe histological and biochemical problems than portacaval shunt alone.

6855 ACUTE BIOCHEMICAL AND HISTOLOGICAL EFFECTS OF PORTACAVAL SHUNT IN THE NORMAL RAT. *(E.)*

Meyers, O. L.; Hickman, R.; Keraan, M.; Engelbrecht, G. H. C.; Webber, B. L.; Terblanche, J. (Dep. Medicine, Univ. Cape Town, South Africa). *S. Afr. Med. J.* 49(26):1048-1050, 1975.

The early course of changes in total serum protein and evidence of liver damage were studied after portacaval shunt. Five groups of 12 rats each were given end-to-side portacaval shunts or were sham operated in a random distribution. Four groups were killed at 6, 24, 48, and 96 hr after surgery and exsanguinated. A final group of six was killed at 24 hr without exsanguination. Liver biopsies were studied by light microscopy and blood samples were subjected to protein electrophoresis and analyzed for antibacterial lipopolysaccharide antibodies and aspartate aminotransferase. Mean albumin levels were similar in shunt and control rats up to 72 hr; at 96 hr levels were significantly higher in the controls. Mean albumin levels fell during the four days in both groups. In the α-globulin fraction in controls, $\alpha_1$and α_2 levels rose, but in shunt rats α_1 levels only rose. The greatest difference between the two groups was in the β-globulin fraction, which rose significantly in 24 hr in the controls, but fell in the shunt rats. Neither group showed a significant change in γ-globulin levels. There was no rise in antibacterial lipopolysaccharide bodies in any animals. Aspartate aminotransferase showed a nine-fold increase in shunted rats from 139.1 Karmen U preoperatively. Controls showed a two-fold increase. Values returned to normal in all rats after 72-96 hr. There was no difference between exsanguinated and nonexsanguinated rats. Biopsies from shunted rats six and 24 hr after surgery showed marked hepatic necrosis. Aspartate aminotransferase levels were significantly elevated. At 48 and 96 hr these areas were undergoing phagocytosis and regeneration; aspartate aminotransferase levels returned to normal. There was minimal collapse of hepatic architecture by day five. It is concluded that portacaval shunt results in hepatocellular damage which returns to normal within 48 hr; shunted animals maintain albumin levels better than sham-operated controls.

6856 CHOLESTEROL AND BILE ACID METABOLISM AFTER RESECTION OF THE SMALL INTESTINE. *(Ger.)*

Weis, H. J.; Dietschy, J. M.; Baas, E. V. (I. Med. Klinik Univ. Mainz, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:419-421, 1974.

Surgery was performed on the small intestine in three groups of 10 rats each: (1) resection of the distal half of the small intestine and anastomosis of the ends; (2) resection of the proximal half of the small intestine and anastomosis of the ends; and (3) sham surgery in which the ileum was cut and anastomosed. The rats were then fed 15 g/day of rat food for seven weeks. Jejunectomized rats weighed the same as controls, while ileectomized rats weighed significantly less. This decrease in body weight can be accounted for by excretion of fat in the stools which was twice as high in ileectomized rats as in the other two groups. In all three groups, serum cholesterol levels decreased slightly between days three and nine after surgery and then reached a plateau above the initial values. Cholesterol synthesis in the liver and intestine, studied by incubation of tissue slices with 2-^{14}C-acetate, remained unchanged after jejunectomy but tripled after ileectomy. Surgery had no effect on CO_2 and fatty acid production in the liver. After jejunectomy, the rate of cholesterol synthesis was significantly higher in the proximal ileum than in controls, while in ileectomized rats cholesterol was synthesized at three times the control value in the jejunum. If the total weight of the small intestine is taken into account in determining cholesterol synthesis, the small intestine of rats in groups (1) and (2) synthesized almost the same amount of cholesterol as that of the controls. Determinations of sterols in the stools revealed that ileectomized rats excreted significantly more neutral and acid sterols than the other two groups of animals. This was also demonstrated indirectly by the decreased taurocholic acid pool and increased turnover rate in ileectomized rats. It is concluded that in ileectomized rats increased excretion of neutral and acid sterols is compensated for by increased hepatic cholesterol synthesis. This compensatory mechanism could also occur in man and account for failure of ileal bypass surgery to reduce high serum cholesterol levels.

6857 FORMS OF PHYSIOLOGICAL LIVER REGENERATION IN ANIMALS UNDER PROLONGED HYPERBARIC CONDITIONS. *(Rus.)*

Dashevskii, B. S.; Kostkin, V. B. (I. M. Sechenov Inst. Evol. Physiol. Biochem., Leningrad, USSR). *Dokl. Akad. Nauk SSSR* 222(1): 254-256, 1975.

The effect of prolonged hyperbary in a helium-oxygen atmosphere on physiological regeneration of the liver was studied in 42 adult rabbits (3 to 3.5 kg). Basic experiments were performed on 16 rabbits in a high-pressure chamber (35 kg/cm^2) in an artificially regenerated helium-oxygen atmosphere (with partial pressure of oxygen 0.31-0.36 kg/cm^2) and at the temperature of 29 to 30 C. After gradual decompression of the high-pressure chamber, the experimental animals were killed, and small portions of their livers were removed. For determinations of the number of mitoses and binuclear cells, at least 3,000 hepatocytes were used. Mononuclear hepatocytes were examined photometrically. The frequency of mitosis under hyperbaric conditions increased by 35% after 12 hr, but decreased by 42% (with respect to the initial value) after 10 to 17 days, and by 48% after 30 days. The degree of polyploid of hepatocytes (the ratio of tetraploid/diploid cells) decreased steadily with the time of exposure to the high pressure (2.2 initially; 0.50 after 12 hr; 0.45 after 30 days). Finally, the measuements of the population of binuclear

cells showed that this type of cell constantly in-
creased with the time of exposure to high pressure
(9% initially; 18% after 12 hr; 24% after 30 days).
Considering that physiological regeneration should
be accompanied by enhanced cellular proliferation
(increased frequency of mitosis), enhanced poly-
ploid, and increased population of binuclear cells,
the results showed that only the last one of the
three indicated prerequisites was satisfied. On the
basis of this fact, it must be concluded that the
possibility of physiological regeneration of the
liver under prolonged hyperbary is substantially
diminished.

5858 THE RELATIONSHIP OF RETICULOENDOTHELIAL DYSFUNCTION AND ENDOTOXEMIA TO SURVIVAL AFTER IEPATIC ISCHEMIA INJURY IN THE BABOON.

(E.) Di Luzio,
I. R.; Olcay, I.; Holper, K.; Drapanas, T.; Trejo, R.
(Tulane Univ. Sch. Medicine, New Orleans, La.). *Cir-
ulatory Shock* 2(2):77-89, 1975.

'he effects of prolonged ischemia on survival, hemo-
ynamics, and hepatocyte and Kupffer cell function were
nvestigated in the subhuman primate. Of 34 baboons
Papio papio), 19 were subjected to 60 or 90 min of
iver ischemia by total vascular occlusion, 9 served
s sham-operated controls, and 6 underwent portacaval
hunting and were subdivided into control and experi-
ental groups. Phagocytic activity of the reticuloen-
othelial system, circulating blood volume, and hepatic
lood flow were determined as well as arterial pH and
lood gases, total plasma bilirubin, glutamic oxalacetic
ransaminase, lactic dehydrogenase, ornithine carbamyl
ransferase activities, and plasma BSP concentration.
eterminations were made before occlusion, and at 3,
4, and 48 hr after restoration of flow. Endotoxin
eterminations were made before, during, and after oc-
lusion. Occlusion for 90 min resulted in 45% survi-
al. Survivors recovered in a few days; the rest died
t a mean of 43 hr. Mean arterial pressure decreased
1% within 5 min of occlusion and maintained that level
ntil restoration in the survivors. In the nonsurvivors,
ressure decreased by 54%. Recovery of pressure was
een in both groups after restoration. BSP retention
as significantly higher in the experimental group (3.27
fter 24 hr) than in controls (0.37). When reticulo-
ndothelial function was tested with ^{131}I-test lipid
mulsion, the survivors had a slightly increased i.v.
/2 time at 3 hr, and increased 120% (to 41 min) at 24
r. The nonsurvivors had an i.v. 1/2 time of 141 min at
 hr, significantly higher than that of the survivors.
ean hepatic blood flow decreased 50 to 60% in the 3 hr
ostocclusion period but returned to normal (21.2 ml/
n/kg) at 24 hr in both survivors and nonsurvivors.
ood volume decreased significantly from normal (98.1
/kg) three hr after occlusion. Further decreases of
% and 48% occurred in survivors and nonsurvivors,
sp., at 24 hr, these values being significantly dif-
rent. Plasma samples from either portal vein and the
moral artery were negative for endotoxin prior to
clusion, but 60% of the animals were positive after
 min of ischemia. After an additional 30 min, all
re positive. There was no correlation between inci-
nce and magnitude of endotoxemia and survival or
nsurvival. In three portacaval shunt animals that
derwent 90 min of ischemia and died, persistent endotoxemia was observed. Peak levels appeared between 6 and 12 hr and ranged from 1.6 to 3.2 mg/ml. Levels declined to 0.5 mg/ml by 24 hr. Phagocytic activity was depressed; the half times at 3 and 24 hr were prolonged 2.4- and 3.8-fold, resp. Depression of reticuloendothelial function and endotoxemia were associated with nonsurvivors, while function was normal in one survivor. One sham-operated animal died after exhibiting depressed phagocytic activity and associated endotoxin increase. It is concluded that 60-90 min of hepatic ischemia was associated with 45% survival and that the degree of reticuloendothelial impairment, but not liver function tests, correlated with survival.

6859 METABOLISM IN THE LIVER DURING CHOLESTASIS.

(Ger.) Llersch, M.; Hesse, W. (Med. Univ. Klinik, Heidelberg, Germany). *Verh. Dtsch. Ges. Inn. Med.* 80:429-432, 1974.

To study the effect of cholestasis and dihydroxy bile acids on liver metabolism, experiments were performed on isolated, perfused livers from fasting male Sprague-Dawley rats which had undergone bile duct ligation 7 days previously. Livers from intact rats served as controls. Bile duct ligation or addition of free or taurine-conjugated chenodeoxycholic acid (0.25 mM) had no effect on endogenous gluconeogenesis, urea synthesis, or the synthesis of lactate and ammonium chloride. No significant differences in the contents of adenine nucleotides, lactate, pyruvate, 3-hydroxybutyrate, acetoacetate, uridine diphosphate-glucose, or glucose were found in livers from bile-duct-ligated rats and intact controls. The glycogen content of livers from the bile-duct-ligated rats was only 50% of the control value, but this can be explained by a reduced food intake in these rats. Since early cholestasis, a decrease in ATP, and pronounced morphological changes have been reported to occur during perfusion of livers from female Wistar rats with chenodeoxycholic acid, experiments were also performed on these animals. In contrast to reports in the literature, chenodeoxycholic acid had a choleretic action and no changes occurred in the ATP content or in hepatic biosynthesis. Perfusion experiments on livers from normal and bile-duct-ligated rats with oleic acid, however, showed that in cholestatic livers ketone body production from oleic acid was decreased to 66% and endogenous production to less than 50% of normal values. Taurochenodeoxycholic acid further reduced ketone body production from oleate to 45% of normal values, but deoxycholic and free and conjugated chenodeoxycholic acid appeared to have no direct effect on normal liver or livers in which the bile ducts were ligated during perfusion, even though bile-duct-ligated livers took up about 50% of the bile acids from the perfusion medium after bile flow ceased. These findings suggest that cholestasis does not have a direct toxic effect on metabolism in the hepatic mitochondria.

6860 EFFECT OF GASTROINTESTINAL FLORA ON BILE ACID METABOLISM IN THE RAT.

(Fr.) Sacquet, E.; Van Heijenoort, Y.; Riottot, M.; Leprince, C. (Laboratory Germ-Free Animals, Gif-sur-Yvette, France). *Biochim. Biophys. Acta* 380(1):52-65, 1975.

The action of the microbial flora of the digestive tract on biliary acids metabolism was studied in germ-free and conventional, exposed male Fischer rats. The animals were fed semi-synthetic diet composed of 220 g of casein, 580 g of corn starch, 90 g of corn oil, 50 g of cellulose, 50 g of mineral mixture and a mixture of vitamins for 50 days. The animals also received 44,000 dpm of (4-^{14}C) cholesterol/g of the diet for 50 days. Due to the regular intake of labeled cholesterol, an isotopic balance was established, so that various chemical species of bile acids showed the same specific activity. This property was used to study bile acid distribution in the liver, intestines and feces. The bile acids were separated by thin-layer chromatography, and the radioactivity was determined by liquid scintillation counter. The masses of the bile acids were determined by 3-hydroxysteroid dehydrogenase test. The bile acids pool in the small and large intestines and cecum was twice as high in germ-free rats as in conventional rats, but fecal excretion was 20% lower in the former. The total bile acids amounted to 4.4 μM in the liver, 100.8 μM in the small intestine, 57.3 μM in the cecum, and 5.7 μM in the large intestine in germ-free rats, and they were 2.9 μM in the liver, 54.6 μM in the small intestine, 18.8 μM in the cecum and 9.1 μM in the large intestine of conventional rats. Cholic and muricholic acids constituted about 90% of the bile acids found in the small intestine of germ-free rats, while their feces also contained appreciable quantities of alpha-muricholic, chenodeoxycholic, and urodeoxycholic acids. Unidentified bile acids accounted for 20% of the fecal bile acids. This relatively large percentage of unknown bile acids in germ-free rats, compared to 40% unknown bile acids in conventional rat feces, made it impossible to determine the influence of bacterial metabolism on the two main pathways of bile metabolism in the rat.

6861 LIVER METABOLISM AND GLUCOGENESIS IN TRAUMA AND SEPSIS. *(E.)* Imamura, M.; Clowes, G. H. A., Jr.; Blackburn, G. L.; O'Donnell, T. F., Jr.; Trerice, M.; Bhimjee, Y.; Ryan, N. T. (Boston City Hosp., Boston, Mass. 02118). *Surgery* 77(6):868-880, 1975.

To determine whether amino acids are transported to the liver for conversion to glucose or for other purposes, and to study the glucogenic function of the liver, the uptake of glucogenic precursors and the production of glucose by the liver were studied. Healthy male and female pigs were used. Portal and hepatic arterial blood flows were measured and blood samples were obtained. The animals were starved for 4 days, then peritonitis was induced by ligation of the cecum below the ileocecal valve. After 3 more days, hemodynamic measurements and blood samples were repeated, and the surviving animals (15) were killed. The rate of glucogenesis was proportional to the sum of the glucogenic precursors taken up by the liver. Higher rates of glucose production were accompanied by elevated blood insulin values. Hepatic oxygen consumption and the rate of uptake of free fatty acids were also related directly to the glucogenic rate, the correlation coefficients being 0.69 and 0.74, resp. In the absence of shock, the liver function and hepatic energy production remained normal in post-traumatic and septic states. It is concluded that in sepsis the release of glucogenic substrates due to altered metabolism in peripheral tissues determines the rate of hepatic glucogenesis.

6862 ACTIVE CHRONIC HEPATITIS. ANIMAL MODEL: CHRONIC MURINE HEPATITIS INDUCED BY REOVIRUS TYPE 3. *(E.)* Stanley, N. F.; Joske, R. A. (Dept. Microbiology, Univ. Western Australia, Nedlands, 6009, Western Australia). *Am. J. Pathol.* 80(1):181-184, 1975.

Observations are reported of 20 yr experience with chronic murine hepatitis induced in more than 100,000 mice by reovirus type 3. Mice surviving a neonatal oronasal infection with the virus develop a progressive disease. Chronic hepatitis is a constant feature; affected mice are runted and jaundiced. These mice usually show a polymorphonuclear leukocytosis, with no evidence of bacterial infection and no antibody to endotoxin. Serum protein levels, especially in the γ-globulin fraction, are increased. Antibody response to sheep RBC, ovalbumin and reovirus type 3 are enhanced. There is an earlier onset and increased incidence of anti-smooth-muscle antibody compared to controls. The basic picture is of progressive liver disease accompanied by immunologic abnormality without the demonstration of virus. Affected mice show thymic atrophy, runting and an increased incidence of reticuloendothelial neoplasm. It is concluded that the value of the murine model lies in both the close clinical and laboratory similarities of the human and murine conditions, and also in the natural route of infection used and the rarity of development of the chronic condition.

6863 PREVENTION OF ALCOHOL-INDUCED FATTY LIVER BY NATURAL METABOLITES AND RIBOFLAVIN. *(E.)* Stanko, R. T.; Adibi, S. A. (Montefiore Hosp., Pittsburgh, Pa.). *Gastroenterology* 68(4):990, 1975.

6864 BILE ACIDS REGULATE INTESTINAL CELL TURNOVER. *(E.)* Raicht, R. F.; Deschner, E.; Salen, G. (VA Hosp., East Orange, N.J.). *Gastroenterology* 68(4):979, 1975.

6865 THE EFFECT OF INSULIN AND GLUCAGON ON HEPATIC BILE FLOW IN EX-VIVO PERFUSED PORCINE AND CANINE LIVER. *(E.)* Ruwart, M. J.; Kaminski, D. L.; Willman, V. L. (St. Louis Univ., St. Louis, Missouri). *Gastroenterology* 68(4):977, 1975.

6866 REGENERATION IN THE CARBON TETRACHLORIDE INJURED RAT LIVER. *(E.)* Rosenkranz, E.; Charters, A. C.; Orloff, M. J. (Sch. Med., Univ. California, San Diego, Calif.). *Gastroenterology* 68(4):976, 1975.

6867 THE EFFECTS OF CHLORPROMAZINE HYDROCHLORIDE (CPZ) ON BILE FORMATION AND BILIARY SECRETION IN THE PRIMATE. *(E.)* Ros, E. R.; Small, D. M.; Carey, M. C. (Boston Univ. Sch. Med., Boston, Mass.). *Gastroenterology* 68(4):975, 1975.

6868 COMPARISON OF GASTRIN AND OCTAPEPTIDE-CCK BINDING AND TENSION DEVELOPMENT IN CAT GALLBLADDERS. *(E.)* Praissman, M.; Chowdhury, R.; Fara, J.; Berkowitz, J. M. (Nassau County Med. Cent., East Meadow, N.Y.). *Gastroenterology* 68(4):968, 1975.

6869 CHARACTERIZATION OF CLOSTRIDIAL CHOLANOYLAMINO ACID HYDROLASE. *(E.)* Patnaik, R. N.; Sokolow, M.; Vocci, M.; Nair, P. P. (Sinai Hosp., Baltimore, Md.). *Gastroenterology* 68(4):966, 1975.

6870 DEPRESSION OF MICROSOMAL ACTIVITY IN THE LIVER OF MICE FOLLOWING SINGLE ADMINISTRATION OF HALOTHANE AND ITS INFLUENCIBILITY BY SILYBIN. *(Ger.)* Janiak, B. (Inst. Anaesthesiologie, Univ. Mainz, Germany). *Anaesthesist* 23(9):389-393, 1974.

6871 PECULIARITIES OF MICROCIRCULATION IN THE LIVER IN ANAPHYLACTIC SHOCK. *(Rus.)* Ovsyannikov, V. G.; Vashetina, S. M. (Rostov Medical Inst., Rostov, USSR). *Biull. Eksp. Biol. Med.* 79(3):79-82, 1975.

6872 THE EFFECTS OF MESENTERICOCAVAL SHUNTS ON MITOCHONDRIAL METABOLISM AND FUNCTION IN THE RAT LIVER. *(It.)* Ursini, F.; Vincenti, E.; Ferri, L. M.; Bertaini, G.; Gregolin, C.; Vassanelli, P.; Stella, G. D.; Pelizzo, M. R.; Rizzi, B. (Istituto Chimica Biologica, Padova, Italy). *Arch. Sci. Med.* 131(4):206-210, 1974.

6873 CYANOSIS OF HEPATIC ORIGIN: VALUES OF PARTIAL PRESSURE OF OXYGEN IN ARTERIAL BLOOD DURING EXPERIMENTAL CIRRHOSIS IN RABBITS. *(Cz.)* Radzikowski, A.; Milanowski, A.; Zalewski, T.; Aleksandrowicz, R. (Academy Medicine, ul. Dzialdowska 1/3, 01-184 Warsaw, Poland). *Pediatr. Pol.* 49(9): 1081-1087, 1974.

6874 LIVER TRANSPLANTATION IN THE RAT: NOTE ON TECHNIQUE AND STATISTICAL EVALUATION OF SOME ENZYME ACTIVITIES IN THE ABSENCE OF IMMUNOSUPPRESSIVE THERAPY. *(It.)* Ronzoni, G.; Pagliari, G.; Grassetti, F.; Ngalikpima, V.; Alma, R.; Nenna, E. (Clinica Medica, Universita Cattolica, Rome, Italy). *Chir. Patol. Sper.* 21(1):1-21, 1973.

6875 EXPERIMENTAL CONTRIBUTION TO THE PROBLEM OF SURGICAL STIMULATION OF LIVER REGENERATION. *(Cz.)* Cerny, J.; Geryk, B. (Dept. Surgery, OUNZ, Zilina, Czechoslovakia). *Bratisl. Lek. Listy* 61(1):38-41, 1974.

6876 EFFECT OF THE RHYTHM OF EXPOSURE TO A HARMFUL AGENT ON THE NATURE OF REPARATIVE REGENERATION OF THE LIVER. *(Rus.)* Sarkisov, D. S.; Paltsin, A. A.; Popova, I. V. Badilovu, A. K.; Vtyurin, B. V. (I. M. Sechenov 1st Moscow Medical Inst., Moscow, USSR). *Arkh. Patol.* 37(1):80-87, 1975.

6877 BIOCHEMICAL AND ULTRASTRUCTURAL FINDINGS ON THE LIVERS OF RATS TREATED WITH ENFLURANE. *(It.)* Gasparetto, A.; Manani, G.; Martines, G.; Grappa, M. T.; Scalella, P. (Cattedra Anestesiologia e Rianimazione, Universita Study, Padua, Italy). *Acta Anaesthesiol. Ital.* 25(suppl):141-167, 1974.

6878 BILE PROTEINS AND THEIR ROLE IN GALLSTONE FORMATION. *(Jpn.)* Katsuki, T.; Ijuin, K.; Kawamura, H. (Kagoshima Univ. Faculty Medicine, Kagoshima, Japan). *Igaku Kenkya* 44(2):90-103, 1974.

6879 PROSTHETIC REPLACEMENT OF THE COMMON BILE DUCT: EVALUATION OF HEPATOBILIARY FUNCTION AFTER PROSTHETIC REPLACEMENT OF THE COMMON BILE DUCT IN THE DOG. *(It.)* Ronzoni, G.; Grassetti, F.; Butti, A.; Doglietto, G. B.; Maria, G.; Maria, G.; Pescatori, M.; Pagliari, G.; Colagrande, C. (Clinica Medica, Universita Cattolica, Rome, Italy). *Chir. Patol. Sper.* 22(3):155-172, 1974.

6880 PHALLOIDIN ANTAGONISTS: PROTECTIVE EFFECT OF DISILYBIN IN PHALLOIDIN-DAMAGED HEPATOCYTES. *(Ger.)* Petzinger, E.; Homann, J.; Frimmer, M. (Fachbereich Veterinarmedizin, Justus-Liebig Universitat, Giessen, Germany). *Arzneim. Forsch.* 25(4):571-576, 1975.

6881 A COMPARISON OF THE INDUCTIVE EFFECTS OF PHENOBARBITAL, METHAQUALONE, AND METHYPRYLON ON HEPATIC MIXED FUNCTION OXIDASE ENZYMES IN THE RAT. *(E.)* Reinke, L. A.; O'Connor, M. F.; Piepho, R. W.; Stohs, S. J. (Univ. Nebraska Medical Center, Lincoln, Neb.). *Res. Commun. Chem. Pathol. Pharmacol.* 11(1):45-53, 1975.

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See also, 6604, 6630, 6712, 6819, 6955, 7575, 7629, 7815.

SECRETION AND METABOLISM

Intestine

6927 A NON-DESTRUCTIVE METHOD FOR MEASURING INTESTINAL CELL TRANSIT TIME. *(Eng.)* Hagemann, R. F.; Cooper, J.; Poulakos, L. (Allegheny General Hosp., 320 E. North Ave., Pittsburgh, Pa. 15212). *Cell Tissue Kinet.* 8(4): 391-396, 1975.

A method is described for measuring intestinal cell transit time using the time of labeling of S phase crypt cells as the 'start' measurement and the time of lumenal digestion of these cells as the 'finish' measurement. Ha/ICR mice were injected with methimazole (1 mg, i.p.); 25 min later they were given sodium thiocyanate (0.05 mg) and 5 min later were given ^{125}I-iododeoxyuridine (^{125}I-UdR) (3 µCi). Methimazole was injected every 2 hr for 12 hr thereafter. Male Holtzman rats (5 mg methimazole, 4 µCi, ^{125}I-UdR), adult male gerbils (2 µCi ^{125}I-UdR), and adult beagle dogs (10 mg methimazole, i.v. every 3 hr, 10 µCi ^{125}I-UdR) were treated according to similar procedures. During methimazole administration, the animals' drinking water contained chlorothiazide (1 mg/ml), a diuretic. At various intervals beginning 24 hr after ^{125}I-UdR, the thyroid and jejunum were counted in a liquid scintillation spectrometer. In the rats, gerbils and mice, for which the intestinal cell transit times are known, the loss of intestinal radioactivity by cell loss from the villi was accompanied by a prompt rise in thyroidal activity. The transit times thus obtained corresponded to the previously established cell transit times in these animals (i.e., 42-46 hr in mice, 38-42 hr in rats, and 120-130 hr in gerbils). The net thyroid activity plots in the dogs, a species in which the transit time values are unknown, indicated an intestinal cell transit time of about 32 to 37 hr. Thus, the mammalian thyroid gland can be used as an *in situ* biological indicator for determining intestinal cell transit time without a requirement for tissue sampling.

6928 QUANTIFICATION OF PHYSIOLOGICAL CHANGES IN GUT ENDOCRINE CELLS: IMMUNOCYTOCHEMICAL AND RADIOIMMUNOASSAYS OF SECRETIN CELL FUNCTION. *(E.)* Polak, J. M. Pearse, A. G. E.; Bloom, S. R.; Joffe, S. N. (Hammersmith Hosp., London, England). *Acta Hepato-Gastroenterol. (Stuttg.)* 22(3):186-189, 1975.

Instrumentation and technology for random sampling of mucosal specimens were developed and are illustrated in five English White pigs by the response of the secretin cells to the instillation of acid into the duodenal mucosa. Acid (0.1 N HCl) was perfused at a constant rate through the duodenum and jejunum which were isolated and cannulated. Eight identical samples of mucosa were freeze dried and fixed in diethylpryrocarbonate vapor and subsequently embedded in paraffin wax. Sections of tissue were cut and subjected to indirect immunocytochemistry using peroxidase labeling; quantification was made using a Television Image conversion analyzer. In an illustration of a representative section of resting duodenal mucosa, six secretin cells are enclosed in circles which contain a heavy black brown deposit of the diaminobenzidine (DAB) polymer which is the final reaction product. In contrast, in a section of mucosa taken after 30 min perfusion with acid, there were five secretin cells which contained DAB polymer in much lesser amount. The mean fall in secretin levels calculated from the results of image analysis amount to 52% as compared to 72% from parallel radioimmunoassays. It is concluded that secretin is released in response to the presence of acid in the duodenum and that the results of immunocytochemical techniques can be quantified by image analysis to provide meaningful data for the interpretation of physiological changes in gut endocrine cells.

6929 THE PANETH CELL: A SOURCE OF INTESTINAL LYSOZYME.

(E.) Peeters, T.; Vantrappen, G. (Laboratorium voor gastrointestinale fysiopathologie, Katholieke Universiteit te Leuven, Belgium). *Gut* 16(7):553-558, 1975.

The presence of lysozyme as a Paneth cell secretory product was studied in the mouse. Small intestine was quickly removed from mice, frozen, and fixed in ethanol. Slices were covered with rabbit antilysozyme antiserum, washed and covered with fluorescent antirabbit immunoglobulin, and examined by fluorescence microscopy. For a separate perfusion study, NMRI mice had the jejunum incised 4 cm and 24 cm distal to the pyloric sphincter, and the 20 cm jejunal segment was perfused with saline at 4.0 ml/hr. The outlet was connected to a fraction collector. Each 1 ml fraction collected corresponded to 15 min of perfusion time. Pilocarpine was injected i.v. after a control period, and the perfusate was assayed turbidometrically for lysozyme. Amylase activity was also determined. Fluorescence microscopy showed a positive reaction in the Paneth cell region of the crypts. Faint fluorescence was seen in other mucous membrane cells. Fluorescence was absent when antilysozyme antiserum was replaced by normal rabbit serum, or when the antiserum was pre-incubated with the pure antigen. Injection of 4 mg of pilocarpine five min before dissection resulted in the disappearance of all crypt fluorescence, while a stream of fluorescence appeared between the villi. After 10 min, a granular fluorescent material was found on top of the villi. The perfusion studies showed initial high amylase levels which decreased over 2.5 hr to a low basal value. Lysozyme started out at a low basal value and remained stable. Pilocarpine injection caused a sharp rise in lysozyme level from the basal value (0.06-0.27 μg/ml) to 3.9 μg/ml, but amylase level was unaffected. Lysozyme concentrations were lower in starved animals (0.16 μg/ml) than in unstarved animals (0.31 μg/ml). It is concluded that lysozyme is present in and secreted by the Paneth cells, and can serve as a marker of Paneth cell function.

6930 OXIDATION-REDUCTION POTENTIALS IN THE CECAL CONTENTS OF RATS AND MICE.

(E.) Koopman, J. P.; Janssen, F. G. J.; van Druten, J. A. M. (Central Animal Lab., Catholic Univ., Nijmegen, Netherlands). *Proc. Soc. Exp. Biol. Med.* 149(4): 995-999, 1975.

The oxidation-reduction potential (ORP) in the cecal contents of conventional adult Wistar rats, Swiss ND_2 germ-free mice, and mice with a Colonization Resistance Factor flora (CRF-mice) was investigated. By using animals that were anesthetized (by α-chloralose) for a longer period of time, the authors attempted to eliminate the disturbing influence of oxygen. In addition, measurements were made under anaerobic conditions. For the rats, the ORP values reached a more or less constant level after about 30 min following the insertion of the electrodes in the cecum. The mean ORP at that time was -458 mV (SD = 45 mV). The mean ORP values for the mice showed a more gradual reduction than was found in the rats. The curves leveled off at about 100 min following the insertion of the electrodes. The mean ORP values 100 min after electrode insertion were: germ-free mice, +3mV (SD = 39 mV); CRF-mice, -554 mV (SD = 20 mV). In rats, the ORP value decreased after death; no decrease was observed in mice. No difference was found in the values obtained when measuring under aerobic or anaerobic conditions after death. The ORP values found in the present study are within the range of those found earlier in the artificial media used for the cultivation of strict anaerobes from the cecum of mice. The present study indicates that the ORP is at the same level *in vivo* and *in vitro*; consequently, it is likely that the cultivation of anaerobic bacteria *in vitro* as described in an earlier report is not negatively influenced by the ORP level.

6931 SUBSTRATE UTILIZATION AND OXYGEN CONSUMPTION BY CANINE JEJUNAL MUCOSA IN VITRO.

(E.) Lester, R. G.; Grim, E. (Dept. Physiology, Univ. Minnesota, Minneapolis 55455). *Am. J. Physiol.* 229(1):139-143, 1975.

Some aspects of canine jejunal mucosal metabolism of endogenous and exogenous substrates are described. Oxygen consumption, carbon dioxide production and substrate utilization in small pieces of jejunal mucosa removed from mongrel dogs were measured in standard Warburg respirometers. Experiments were performed with tissues from three dogs in which no exogenous substrate was added to the incubation flasks. The preparation typically continued to respire until the study was discontinued at 4 hr, the rate being relatively stable for 1 hr, after which there was slow decline to a final value which was about 2/3 the initial value. Regular cyclic fluctuations were present, with a period of 35 to 40 min and an amplitude of 30 to 40% of the mean value. Oxygen consumption was 0.21 μM/hr/mg, dry weight, and the respiratory quotient was 0.73. Addition of ^{14}C-labeled glucose or galactose (200 mg/100 ml) increased both oxygen consumption (0.33 and 0.28 μM/hr/mg, dry weight, resp.) and the respiratory quotient 0.90 and 0.83, resp.). Endogenous substrate metabolism was decreased by $[^{14}C]$ fructose (200 mg/100 ml), but not by glucose or galactose. Less than 15% of the metabolized glucose and fructose was degraded to CO_2. Of the metabolized glucose, 80% was recovered as lactate. Galactose disappeared at 1/7 the rate of glucose, but 40% of that metabolized was degraded to CO_2. It is suggested that the cycles observed in all experiments were due to an *in vivo* tissue mechanism.

6932 ENZYME PATTERNS AND PROTEIN ABSORPTION IN RAT COLON DURING DEVELOPMENT.

(E.) Helander, H. F. (Dept. Anatomy, Univ. Umea, Sweden). *Acta Anat.* 91(3):330-349, 1975.

The functional development of the rat colonic mucosa reflected in the contents of carbonic anhydrase, β-D-galactosidase, and acid and alkaline phosphatase was studied. Carbonic anhydrase activity reached a peak in 10-day-old rats which was about seven times the activity in the newborn rat. A peak value for β-D-galactosidase was detected 1 day after birth. Alkaline phosphatase displayed a pattern similar to that of β-D-galactosidase. The activity of acid phosphatase showed a flat curve with a poorly marked maximum at 5-10 days of age. A fairly weak staining reaction for carbonic anhydrase was found mainly at the surface of the mucosa during peak activity. A similar reaction held for β-D-galactosidase. Alkaline phosphatase activity was generally confined to the brush border, the lateral cell borders, close to the walls of vesicles in or subjacent to the terminal web region and in 0.5 to 2.0 μm large rounded bodies in the supranuclear cytoplasm. Most of the acid phosphatase activity was concentrated in the supranuclear bodies. Milk peroxidase and insulin enemas were absorbed in the infant rat colon, but this capacity was much reduced after weaning. It is suggested that the colonic mucosa may have a different function in the infant than in the adult.

6933 DIFFERENTIATION AND MATURATION OF CULTURED FETAL RAT JEJUNUM.

(E.) DeRitis, G.; Falchuk, Z. M.; Trier, J. S. (Harvard Medical Sch., Boston, Mass. 02115). *Dev. Biol.* 45(2):304-317, 1975.

To determine whether differentiation and maturation of mammalian intestinal mucosa require factors available only *in vivo* or factors available both *in vivo* and *in vitro*, jejunum from fetal (18th day of gestation) Sprague-Dawley rats was cultured in chemically defined medium using organ culture methodology. Jejunal segments were cultured in modified Leibowitz L-15 medium in room air at 37 C for 24, 48, or 72 hr, after which they were examined by light and electron microscopy. Uncultured jejunum had either no or very few rudimentary villi and was lined largely by undifferentiated stratified epithelium. Goblet cells were not seen. In contrast, villi were present in most of the 24-hr cultures, and simple columnar rather than stratified epithelium predominated. After 48 and 72 hr, villi were present in over 90% of the cultured segments and the stratified epithelium had disappeared. Goblet cells were seen in jejunal segments cultured 48 hr or longer in 47 of 74 fetuses. Electron microscopy further documented the progressive differentiation of the epithelium during culture. Microvilli increased in number and height, a terminal web developed in the apical cytoplasm, and the number of apical vesicles, mitochondria, and formed elements of endoplasmic reticulum increased in the absorptive cells. Jejunal lactase and alkaline phosphatase activity increased 9- and 7-fold, resp., during 72 hr of culture, while the activity of the mitochondrial enzyme ornithine carbamoyl transferase increased 4-fold. The data indicate that jejunum from 18-day fetal rats can be cultured *in vitro* for at least 72 hr in chemically defined medium and that, during culture, maturation of the jejunal mucosa takes place with the appearance of villi, conversion of stratified to columnar epithelium, and differentiation of individual epithelial cells.

6934 HUMAN INTESTINAL SUCRASE-ISOMALTASE. IDENTIFICATION OF FREE SUCRASE AND ISOMALTASE AND CLEAVAGE OF THE HYBRID INTO ACTIVE DISTINCT SUBUNITS.

(Eng.) Conklin, K. A.; Yamashiro, K. M.; Gray, G. M. (Stanford Univ. Sch. Medicine, Stanford, Calif. 94305). *J. Biol. Chem.* 250(15):5735-5741, 1975.

The interrelation of the hybrid sucrase-isomaltase complex and its active sucrase and isomaltase subunits in homogenates of human small intestine (obtained at autopsy 1-16 hr after death) was examined. The complex and its functional subunits were identified by Sephadex 6-200 (superfine) chromatography aided by isomaltase moiety affinity for dextran gel; this moiety bound strongly to the gel at 4 C, requiring two column volumes for elution. Bio-Gel P-300 chromatography, density gradient (100,000 to 300,000 x *g* at 4 C for 4-6 hr), and equilibrium centrifugation (300,000 x *g* for 72 hr and 97 hr at 4 C) demonstrated that the sucrase subunit and the isomaltase subunit are similar, but unequal in size (Stokes radius = 45, 43 Å; frictional ratio = 1.32, 1.30; $S_{20,w}$ = 6.9, 6.6; MW = 130,000, 120,000 resp.). The sucrase-isomaltase complex (Stokes ratio = 70 Å, frictional ratio = 1.61, $S_{20,w}$ = 9.8, MW = 280,000) appeared as an elongated hybrid molecule and was less symmetrical than the subunits. Apparent K_m and pH activity curves were indistinguishable for each enzyme in the hybrid of the free state. The complex accounted for 90% of the intestinal sucrase and isomaltase activities and was isolated and cleaved by 0.01 M β-mercaptoethanol/6 M urea treatment into subunits which have identical biochemical characteristics with the free sucrase and isomaltase moieties. Sodium dodecyl sulfate acrylamide gel electrophoresis also produced subunits with molecular weights very close to those for active free sucrase and isomaltase moieties, indicating that each α-glucosidase consisted of a single polypeptide chain. Immunization of rabbits with pure sucrase-isomaltase complex yielded a monospecific precipitating antibody which reacted with the hybrid and the sucrase moiety, but which showed minimal affinity for the isomaltase subunit; this provides further evidence that the sucrase-isomaltase molecule is a hybrid consisting of two distinct α-glucosidases. It is also suggested that the two nonidentical subunits act independently on their respective substrates.

6935 INTRACELLULAR DISTRIBUTION OF β-GALACTOSIDASES IN MUCOSAL CELLS FROM HOG SMALL INTESTINE.

(E.) Sato, M.; Yamashina, I. (Faculty Pharmaceutical Sci., Kyoto Univ., Japan). *Biochim. Biophys. Acta* 397(1):179-187, 1975.

The intracellular distribution of three β-galactosidases (hetero β-galactosidase, lactase, and acid β-galactosidase) in the hog small intestinal mucosa was studied. The mucosa was homogenized and separated into five subcellular fractions (I-V) by differential centrifugation. Purified brush borders and mucosal lysosomes were also prepared. The β-galactosidases were identified by hydroxylapatite column chromatography, and the various preparations were assayed for hetero β-galactosidase, lactase, sucrase, acid and alkaline phosphatases, glucose-6-phosphatase, NADPH-cytochrome c reductase, and cytochrome oxidase. Sucrase activities were higher in fractions III (lysosomal fraction) and IV (microsomal fraction) than in fraction I (nuclei and brush borders). Fraction III also contained significant amounts of microsomes, microvilli, and mitochondria, fraction II consisted mainly of mitochondria, and fraction IV contained microsomes, microvilli, and lysosomes. Lactase activity essentially paralleled the distribution of sucrose activity in the subcellular fractions, and most of the hetero β-galactosidase activity was found in fraction V (cytosol fraction). Some lactase and acid β-galactosidase activities were also found in the cytosol fractions. Sucrase activity was high in the purified brush borders, the lactase activity in this preparation being about 7-fold greater than in the homogenate and the hetero and acid β-galactosidase activities being lower than in the homogenate. The ratios of hetero β-galactosidase and acid β-galactosidase to lactase in the brush border preparations were 1:3.6 and 1:0.11, respectively. The lysosomal preparations contained low lactase and hetero β-galactosidase activities and high levels of acid β-galactosidase activity. It is concluded that acid β-galactosidase is a lysosomal enzyme and that lactase is localized in the brush borders.

6936 ADENYLATE AND GUANYLATE CYCLASE ACTIVITIES AND CELLULAR DIFFERENTIATION IN RAT SMALL INTESTINE.

(E.) Quill, H.; Weiser, M. M. (Harvard Medical Sch., Boston, Mass.). *Gastroenterology* 69(2):470-478, 1975.

Nucleotide cyclase levels and cyclic nucleotide phosphodiesterase activities were measured in the small intestinal villus and crypt cells of nonfasted female Holtzmann rats to determine possible correlations with cellular differentiation and subcellular localization. The intestinal epithelial cells were isolated into villus and crypt gradients by the method of Weiser. The different preparations were homogenized and the supernatant fractions were assayed for adenylate cyclase, guanylate cyclase, phosphodiesterase, and sucrase. The guanylate cyclase activity in the crypt cells was significantly lower than in the villus cells, the reverse being true for adenylate cyclase. There was no gradient activity for cyclic guanosine 3':5'-monophosphate phosphodiesterase, although cyclic AMP phosphodiesterase activity was lower in the villus cells than in the crypt cells. No villus to crypt gradient of cyclic AMP activity was detected in intestinal mucosa frozen rapidly in liquid nitrogen. When isolated villus cells were homogenized and fractionated by differential centrifugation, the highest specific activity of both adenylate and guanylate cyclase was in the 20,000 *g* pellet. A small amount of adenylate cyclase, but no guanylate cyclase, activity was found in the soluble fraction. The (Na^+, K^+)-ATPase-rich lateral-basal membrane fraction isolated from the 20,000 *g* pellet by sucrose gradient centrifugation showed a 5-fold greater specific activity for adenylate cyclase than was found in the homogenate; the guanylate cyclase activity of the membrane fraction was lower than in the homogenate. The specific activity of guanylate cyclase increased 5-fold with purification of the microvillus membranes (isolated from homogenates of mucosal scrapings), but this preparation had no detectable adenylate cyclase activity. Preparations of isolated nuclei contained no detectable adenylate cyclase activity and the nuclear guanylate cyclase activity was decreased in comparison with the homogenate. The data suggest that guanylate cyclase has a specialized role in the differentiated villus cell and that the cyclases may be interrelated, possibly reflecting the epithelial cell polarity for absorption and secretion.

6937 THE NUTRITIVE EFFECT OF GLUCOSE ON THE STRUCTURE AND FUNCTION OF JEJUNAL SELF-EMPTYING BLIND LOOPS IN THE RAT.

(E.) Menge, H.; Werner, H.; Lorenz-Meyer, H.; Riecken, E. O. (Medizinsche Universitats-Klinik, Marburg-an-der-Lahn, West Germany). *Gut* 16(6):462-467, 1975.

The effects of glucose, galactose and Ringer's solution on the development of mucosal structure and function were studied in jejunal self-emptying blind loops. Female Wistar rats were provided with a blind loop from the proximal jejunum. Beginning 5 days after operation, the animals were infused with 3 ml of the infusate three times/day for 27 days. Group I received an isotonic glucose (36.5 g/l) and NaCl (3.0 g/l) solution (nine rats) or Ringer's solution (control; nine). Group II received an isotonic galactose (36.5 g/l) and NaCl (3.0 g/l) solution (nine) and Ringer's (controls; nine). The blind loops were excised for histological examination and morphometric evaluation on day 32. Only rats infused with galactose lost weight during the first 4 days after operation. There was no difference in weight between any of the groups after this. There was a significant increase in villus height with infusion of glucose; the villus height to crypt length ratio was also increased. Maltase activity showed a marked rise with glucose infusion (47.3 U/g protein compared with control, 38.5 U/g protein). A reduction in peptidase activity was also observed with glucose. Infusion of galactose tended to lower dipeptidase levels. Glucose absorption was enhanced in loops perfused with both glucose and galactose, although the effect of galactose (2.07 mg/cm of intestine/hr) was not as great as that of glucose (2.23 mg/cm of intestine/hr). These results indicate an apparent increase in the number of transport sites for monosaccharides, which is induced by the presence of a substrate (glucose or galactose) within the experimental loop.

6938 THE INFLUENCE OF FOOD INTAKE ON THE DEVELOPMENT OF STRUCTURAL AND FUNCTIONAL ADAPTATION FOLLOWING ILEAL RESECTION IN THE RAT.

(E.) Menge, H.; Grafe, M.; Lorenz-Meyer, H.; Riecken, E. O. (Medizinische Universitats-Klinik, Marburg-an-der-Lahn, West Germany). *Gut* 16(6):468-472, 1975.

The influence of food consumption on adaptive changes in the intestinal mucosa was studied following ileal resection, under pair-fed and free-fed conditions. Female Wistar rats (14) underwent ileal resection and end-to-end anastomosis; another nine rats were sham-operated. For 3 days after surgery, the rats were fed with a sugar salt solution. Following this, nine of the ileal-resected rats were pair-fed and the remaining five were allowed food *ad libitum*. The pair-fed, ileal-resected rats had significantly lower body weights than either the sham-operated controls or the free-fed ileal-resected rats. There was no difference in the mucosal structure of controls and pair-fed ileal-resected rats. The free-fed group, however, had hypertrophic mucosae, with taller and wider villi, deeper crypts, larger epithelial cells and thicker muscular layers. Both glucose absorption and the glycyl-L-leucine activity were significantly increased in pair-fed and free-fed, ileal-resected rats. These data confirm the absence of changes at the cellular level, indicating that the stimulation of absorptive capacity results from an increase in the number of absorbing cells, rather than from an augmentation in the activity of individual cells.

6939 PROTEIN AND GLYCEROLIPID BIOSYNTHESIS IN ISOLATED EPITHELIAL CELLS OF NORMAL AND BILE-FISTULA RATS. *(E.)* O'Doherty, P. J. A.; Yousef, I. M.; Kakis, G.; Kuksis, A. (Dept. Biochemistry, Univ. Toronto, Canada M5G 1L6). *Arch. Biochem. Biophys.* 169(1):252-261, 1975.

Alterations in biochemical transformations accompanying the deprivation of lysophosphatidylcholine or choline in isolated intestinal epithelial cells were studied. Fat-filled cells were prepared from normal and 1-day bile-fistula rats. Protein synthesis from [1-^{14}C]leucine (2 µCi) was decreased 40 to 45% in cells from bile-fistula rats, and glycoprotein synthesis from [1-^{14}C]glucosamine (1 µCi), 25 to 30%. The synthesis of phosphatidylcholine from a variety of precursors was decreased 40 to 45% while no change was seen in the formation of either phosphatidylethanolamine or triacylglycerols. Chylomicron release was inhibited 70-80% in bile-fistula cells. *In vitro* addition of either lysophosphatidylcholine or choline (6-10 µM or higher, resp.) to bile-fistula cells resulted in greatly increased phosphatidylcholine and protein biosynthesis and an effective release of chylomicrons. It is suggested that biliary diversion may effectively starve the intestinal cells of choline, resulting in decreased phosphatidylcholine biosynthesis, which in turn causes decreased protein synthesis and incorporation into chylomicrons.

6940 EFFECT OF PUROMYCIN IN VITRO ON PROTEIN AND GLYCEROLIPID BIOSYNTHESIS IN ISOLATED EPITHELIAL CELLS OF RAT INTESTINE. *(E.)* O'Doherty, P. J. A.; Kuksis, A. (Dept. Biochemistry, Univ. Toronto, Ontario, Canada M5G 1L6). *Int. J. Biochem.* 6(6):435-441, 1975.

The early events accompanying puromycin poisoning of isolated intestinal absorptive cells *in vitro* were studied. Fat-filled mucosal absorptive cells were prepared from male Wistar rats. Analysis of the incorporation of [^{14}C]leucine (20 mCi/mM) into the total protein of intestinal epithelial cells showed a linear increase in uptake over the first 30 min for controls, after which uptake levelled off. The addition of long puromycin led to an 85 to 90% inhibition of protein synthesis at 1 hr. Addition of puromycin caused little inhibition of [^{14}C]glucosamine (30 mCi/mM) uptake in hr 1, and only a 10 to 20% decrease by hr 2. Addition of puromycin caused a 30 to 40% inhibition of chylomicron secretion. Triacylglycerol synthesis from [2-^{3}H]glycerol (200 mCi/mM) was not affected. Phosphatidylcholine showed a 35% inhibition by the end of hr 2. Addition of puromycin produced no change in the triacylglycerols of the cells or chylomicrons, while the specific activity of the phosphatidylcholines decreased. Addition of puromycin had no effect on the incorporation of 2-hexadecyl-[2-^{3}H]-glycerol (3.5 x 10^3 µCi/µM) into 1,3-diacyl-2-alkyl-*sn*-glycerols. Incorporation of 1-acyl-*sn*-[2-^{3}H]glycerol-3 phosphorylcholine (130,000 dpm/µM) into phosphatidylcholine was only inhibited 20 to 25%. It is concluded that the effect of puromycin is due to its interference with the normal biogenesis of the endoplasmic reticulum, which involves both protein and phospholipid biosynthesis.

6941 THE POSSIBLE ROLE OF PANCREATIC PROTEASES IN THE TURNOVER OF INTESTINAL BRUSH BORDER PROTEINS. *(E.)* Alpers, D. H.; Tedesco, F. J. (Washington Univ. Sch. Medicine, St. Louis, Mo. 63110). *Biochim. Biophys. Acta* 401(1):28-40, 1975.

The possible effect of pancreatic proteases on the turnover of intestinal brush border enzymes was examined in nine male Wistar rats subjected to 95% pancreatectomy. At time of sacrifice three to six months later, four animals were considered to have recovered pancreatic function; all four had a vitamin B12 absorption greater than 50% which did not increase with the addition of trypsin. In addition, the proteolytic activity of their intestinal juice was comparable to that of nonoperated control rats. The remaining five animals were judged to have pancreatic insufficiency and especially protease deficiency. Enzyme studies on homogenates of the proximal third of the small intestine revealed a 50% increase in specific lactase, sucrase, and maltase activities in all nine animals. Protein turnover was measured *in vivo* using double labeling with [^{3}H]- and [^{14}C] valine. Proteins with apparent molecular weights of about 200,000-270,000 turned over more rapidly than small proteins. The ^{3}H/^{14}C ratio ranged from 4.7 to 6.2 in animals without pancreatic insufficiency and from 2.3-3.1 in those with decreased pancreatic proteolysis. Estimates of relative synthetic rates of large brush border proteins were lower than normal in pancreatectomized animals, but were constant over the period of the labeling experiment. *In vitro*, using purified brush borders, unfractionated pancreatic enzymes removed sucrase, maltase and lactase, but not alkaline phosphatase and trehalase. A model is thus proposed for the normal catabolism of some large intestinal brush border proteins. It is suggested that the surface of intestinal absorptive cells is being constantly remodeled, and that certain surface enzymes are in part removed from the membrane by the action of pancreatic proteases.

6942 THE EFFECT OF DUODENAL JUICE ON THE INTRINSIC FACTOR (IF) ACTIVITY IN GASTRIC JUICE. *(E.)* Vatn, M. H. (Ulleval Hosp., Oslo 1, Norway). *Scand. J. Gastroenterol.* 10(1):49-53, 1975.

The effect of duodenal juice on intrinsic factor (IF) activity in gastric juice during basal conditions and during stimulation with gastrointestinal hormones was studied to evaluate the effect of refluxed duodenal juice on IF measurements. Gastric and duodenal juice was collected from six healthy subjects for 15 min basally and in seven 15-min periods of stimulation. The pH after reneutralization was between 6.8 and 7.6 in all samples. IF concentration was reduced by all of five samples of duodenal juice ($P < 0.05$). IF or unspecific viatmin B_{12}-binding concentrations were not significantly altered by pentagastrin (1 μg/kg/hr) stimulation. IF concentration was decreased by adding fourth to seventh period samples of secretin-stimulated (2 U/kg/hr) duodenal juice and incubating for 2 hr at 37 C. This small decrease was seen in all of six samples ($P < 0.05$) at all pH values. Unspecific B_{12}-binding concentration was increased in all samples with reduced IF concentration ($P < 0.05$). IF concentration was greatly reduced ($P < 0.05$) in all of six samples by first to third period samples of duodenal juice stimulated by 20% cholecystokinin (2 U/kg/hr), especially at low pH values. Unspecific B_{12}-binding showed similar values. Of 34 samples of gastric juice mixed with duodenal juice, 17 showed decreased intrinsic factor and unspecific B_{12}-binding concentrations. A simultaneous decrease of IF and increase of B_{12}-binding were seen in all samples with bilirubin concentrations above 1.5 mg/100 ml. These data indicate that IF measurements may be influenced by duodenal juice.

6943 EFFECT OF THYROIDECTOMY ON THE ACTIVITY OF α[SIC]-GLUCOSIDASES AND ACID HYDROLASES IN THE SMALL INTESTINE OF RATS DURING WEANING. *(Eng.)* Koldovsky, O.; Jumawan, J.; Palmieri, M. (Children's Hosp., Philadelphia, Pa. 19104). *J. Endocrinol.* 66(1):31-36, 1975.

The effect of thyroidectomy on the activity of the small intestinal β-glucosidases and acid hydrolases was studied in suckling Charles River rats. The pups were adrenalectomized on day 14 postpartum and half of them were thyroidectomized. At various times after surgery, the small intestine was divided into three segments and assayed for acid β-galactosidase, *N*-acetyl-β-glucosaminidase, β-glucuronidase, sucrase, maltase and protein. No sex differences were observed. Adrenalectomy slowed the growth of the animals and the small intestines; it also delayed the normal increase in the activities of sucrase and maltase and the normal decrease in the activities of acid β-galactosidase, β-glucuronidase, and *N*-acetyl-β-glucosaminidase during the third postnatal week. Simultaneous thyroidectomy had no effect on the adrenalectomy-induced inhibition of body weight and small intestinal growth, but it caused a further substantial delay in the maturation of the enzyme profile of the small intestine. The changes were observed in both the ileal and jejunal segments. The data indicate that the thyroid as well as the adrenals is involved in the regulation of enzyme activities during weaning, and that the thyroid can act independently of the adrenals on several intestinal enzymes.

6944 CYTOCHROME P-450 AND DRUG METABOLISM IN INTESTINAL VILLOUS AND CRYPT CELLS OF RATS: EFFECT OF DIETARY IRON. *(E.)* Hoensch, H.; Woo, C. H.; Schmid, R. (San Francisco Medical Center, Calif. 94143). *Biochem. Biophys. Res. Commun.* 65(1):399-406, 1975.

Drug-metabolizing activity in different cell populations of rat intestinal mucosa were investigated. Mature villous tip cells, functionally less differentiated intermediate villous cells and proliferating crypt cells were obtained from rats on various dietary regimens and assayed for benzpyrene hydroxylase and *p*-nitroanisole O-demethylase activity, and for cytochrome P-450 and b_5 content. Monooxygenase activity in microsomes from whole intestinal mucosa was highest in the upper small intestine and decreased progressively towards the terminal ileum. Mature villous tip cells contained more cytochrome P-450 and b_5 than those of more distal parts of the small intestine. The respective values for duodenal and ileal mucosa were: cytochrome P-450, 0.110 and 0.051 nM/mg of microsomal protein; and cytochrome b_5, 0.109 and 0.076 nM/mg. The activities of microsomal hemoproteins and drug metabolism in villous tip cells of duodenal mucosa were studied after maintenance on the following diets: standard chow diet; semisynthetic iron-supplemented diet; semisynthetic low iron diet for 2 days; and semisynthetic low iron diet for 2 days, followed by iron-supplemented diet for 24 hr. Cytochrome P-450 content and drug-metabolizing activity of villous tip cells after the third diet decreased to 42 and 13% of control values, but were restored within 24 hr in the last diet. These data suggest that intestinal drug metabolism is primarily localized in upper villous cells of duodenal mucosa, that cytochrome P-450 is synthesized in maturing epithelial cells as they migrate to the top of the mucosal villus, and that this process is critically dependent on dietary iron.

6945 EXPERIMENTAL PRODUCTION OF ELEVATED SERUM FOLATE IN DOGS WITH INTESTINAL BLIND LOOPS. II. NATURE OF BACTERIALLY PRODUCED FOLATE COENZYMES IN BLIND LOOP FLUID. *(E.)* Bernstein, L. H.; Gutstein, S.; Efron, G.; Wager, G. (Albert Einstein Coll. Medicine, Bronx, N.Y. 10461). *Am. J. Clin. Nutr.* 28(8):925-929, 1975.

The nature of the bacterially produced folate coenzymes present in intestinal blind loop fluid and the nature of the glutamate chain of these coenzymes were studied in canine jejunal and ileal blind loops. Twelve weeks after creation of each loop, the feculent material was removed and centrifuged. The supernatant fluid was removed, treated with mercaptoethanol, and eluted on standard DEAE Sephadex A-25 columns. The fluid was assayed with *Lactobacillus casei*, *Streptococcus faecalis*, and *Pediococcus cerevisiae*. Column chromatography of high and low blind loop fluid revealed four discernible peaks when assayed by *L. casei:* augmentation of loop fluid with authentic folate coenzymes indicated that peak I was 5-formyltetrahydrofolic acid; peak II, 5-methyltetrahydrofolic acid; and peak III, tetrahydrofolic acid; peak IV was not identifiable. Assays with *S. faecalis* revealed disappearance of peaks II and IV, suggesting that peak IV was not free folic acid. Assays with *P. cerevisiae* revealed disappearance of peak II only. Peak IV was therefore a reduced folate utilizable by *P. cerevisae* and *L. casei* but not by *S. faecalis*. When fractions of peak IV were exposed to guinea pig intestinal lysosomal conjugate and reassayed with *S. faecalis*, folates of peak IV became available to this organism. Thus, peak IV was indeed a reduced triglutamate, presumably 5-formyltetrahydrofolate triglutamate. The occurrence of this compound in blind loop fluid indicates that polyglutamates can survive undigested within the lumen.

6946 INTESTINAL VILLUS AND CRYPT CELL RESPONSE TO CHOLERA TOXIN.

(E.) Weiser, M. M.; Quill, H. (Harvard Medical Sch., Boston, Mass.). *Gastroenterology* 69(2):479-482, 1975.

The effect of cholera toxin on the adenylate cyclase activity of the small intestinal villus and crypt cells of fasted Holtzman rats (200 g each) was measured *in vivo* and *in vitro*. The rat abdomen was opened and two sections of midintestine (approximately 20 cm long and separated by 10 cm) were tied off and filled--the control loop with 0.154 M of NaCl and the test loop with cholera toxin (1 μg/ml in 0.154 M NaCl). Proximal and distal segments were used alternately for cholera toxin treatment. Villus tip to crypt cells were obtained in sequential order and pooled to give an upper, mid and lower villus fraction and a crypt fraction. Basal and fluoride-stimulated adenylate cyclase activities were measured after 3-hr incubation. Loops from proximal and distal segments showed similar responses to toxin treatment. Upper villus cell fractions exposed to cholera toxin showed a 3-fold increase in basal adenylate cyclase activity over controls. The lower villus cells also showed a significant increase in basal activity whereas crypt cell response was not significantly elevated. Fluoride-stimulated adenylate cyclase activity usually showed a slight decrease after exposure to cholera toxin. Low crypt cell adenylate cyclase activity was attributed to the lowered ability of cholera toxin to bind *in vivo* to crypt cells; the toxin did not appear to reach crypt cells in significant concentrations *in vivo* and incubation with ^{125}I-cholera toxin demonstrated binding only to villus cells. No response could be demonstrated for isolated villus or crypt cells incubated with cholera toxin *in vitro*. Thus, cholera toxin was found to exert its major effect in intestinal villus cells rather than the crypt cells, suggesting that the crypt cell does not participate in the major changes observed with cholera toxicity.

6947 EFFECTS OF CRUDE AND PURE CHOLERA TOXIN ON PROSTAGLANDIN RELEASE FROM THE RABBIT ILEUM.

(E.) Bedwant, J. R.; Okpako, D. T. (Dept. Pharmacology, Univ. Cambridge, England). *Prostaglandins* 10(1):117-128, 1975.

The effects of crude and pure cholera toxins on the release of prostaglandin-like substances (PLS) from the rabbit ileum were investigated *in vivo* and *in vitro*. The ileum of the rabbits was perfused with buffer alone (Krebs-bicarbonate or Krebs-phosphate) followed by buffer containing crude toxin (lyophilized crude culture filtrate of *Vibrio cholerae*) (50 mg/ml) or pure toxin (10 μg/ml), followed by buffer alone. In three *in vivo* experiments, the inclusion of crude toxin in the perfusion fluid was followed by a release of PLS from the ileum. The amount of PLS rose from non-detectable (< 5 ng - < 19 ng PGE_2 Eq/30 min) during perfusion with buffer alone to peak values of approximately 37.5 ng PGE_2 Eq/30 min during or after perfusion with toxin containing buffer. In contrast, no detectable PLS was released when ileal loops were perfused with pure toxin. In two *in vitro* experiments with crude toxin at concentrations of 5 and 50 mg/ml in each, PLS in amounts up to 107 ng PGE_2 Eq/g tissue were found after one to four hr of incubation in the higher concentration of toxin. The pure toxin did not cause any detectable release of PLS from the ileum. In rabbits treated with 16 mg/kg indomethacin, fluid accumulation was diminished in sacs injected with either crude or pure toxin. Treatment with 1.6 mg/kg had no effect. It is concluded that crude and pure toxin have quantitatively similar effects on the secretion of fluid into ileal sacs *in vivo*. The results support the view that prostaglandins do not play an essential role in the action of cholera toxin on ileal fluid secretion. Because crude and pure cholera toxin differ in their effects on prostaglandin release, there is need for caution when interpreting results obtained with crude preparations of bacterial toxins.

6948 INHIBITION OF GUANYLATE CYCLASE AND CYCLIC GMP PHOSPHODIESTERASE BY CHOLERA TOXIN.

(Eng.) Kiefer, H. C.; Atlas, R.; Moldan, D.; Kantor, H. S. (Northwestern Univ. Medical and Dental Sch., Chicago, Ill. 60011). *Biochem. Biophys. Res. Commun.* 66(3):1017-1023, 1975.

The effects of cholera toxin (injected *in vivo* into closed loops of distal ileum) on the activities of adenylate and guanylate cyclase and cyclic GMP phosphodiesterase were studied *in vitro* in rabbit small intestinal epithelial cells at periods 4 to 6 hr subsequent to toxin exposure. There was a simultaneous dose-dependent activation of adenylate cyclase and a deactivation of guanylate cyclase. In addition, the activity of phosphodiesterase catalyzing the hydrolysis of cyclic GMP was reduced in a dose-dependent fashion in most intestinal loops; approximately one of every 15 loops assayed failed to show a depression in cyclic GMP phosphodiesterase activity upon cholera toxin exposure, however. The values of the apparent dissociation constants representing the interaction of the toxin molecule (M.W., 84,000 daltons) with the receptors mediating all three observed cellular activities were similar: adenylate cyclase activation, $K_d = 5.0 \times 10^{-9}$ M; guanylate cyclase inhibition, $K_d = 4.4 \times 10^{-9}$ M; cyclic GMP phosphodiesterase repression, $K_d = 2.1 \times 10^{-9}$ M. The data indicate that cholera toxin interacts with a class of binding sites of average affinity represented by $K_d = 3.8 \times 10^{-9}$ M; this binding appears to be of profound importance to the intracellular balance between cyclic nucleotides which may play a vital role in the cellular regulatory machinery.

6949 SMALL INTESTINAL GROWTH AND MUCOSAL DISACCARIDASE ACTIVITIES IN DIABETIC AND PROTEIN DEFICIENT PREGNANT RATS. *(E.)* Younoszai, M. K. (Dep. Pediatr., Univ. Iowa, Iowa City, Iowa). *Gastroenterology* 68(4):1016, 1975.

6950 PROSTAGLANDIN E (PGE) IN CHOLERA TOXIN (CT) INDUCED INTESTINAL SECRETION. *(E.)* Hindi, S.; Hudson, N.; Wilson, D. E. (Dep. Med., Univ. Illinois, Chicago, Ill.). *Gastroenterology* 68(4):1013, 1975.

6951 SERUM GASTRIN RESPONSE AFTER JEJUNECTOMY IN THE RAT. *(E.)* Flores, G.; Hughes, W.; Tawil, T.; Weser, E. (Univ. Texas Health Sci. Cent., San Antonio, Tex.). *Gastroenterology* 68(4):1012, 1975.

6952 THE ROLE OF PANCREATIC ENZYMES IN THE BREAKDOWN OF ANTIGENS AND ANTIGEN-ANTIBODY COMPLEXES ON THE SURFACE OF THE GUT. *(E.)* Walker, W. A.; Isselbacher, K. J.; Bloch, K. J. (Massachusetts Gen. Hosp., Boston, Mass.). *Gastroenterology* 68(4):1008, 1975.

6953 PEROXIDASE ACTIVITY AS A CHEMICAL INDEX OF INFLAMMATION IN THE SMALL INTESTINE. *(E.)* Smith, J. W.; Castro, G. A. (Univ. Texas Med. Sch., Houston, Tex.). *Gastroenterology* 68(4):989, 1975.

6954 THE MECHANISM OF DUODENAL DISPOSAL OF ACID AND ALKALI. *(E.)* Fiddian-Green, R. G.; Silen, W. (Harvard Med. Sch., Boston, Mass.). *Gastroenterology* 68(4):988, 1975.

6955 HEPATIC METABOLISM OF THE INTESTINAL PHASE HORMONE. *(E.)* Orloff, M. J.; Charters, A. C.; Knox, D. G. (Sch. Med., Univ. California, San Diego). *Gastroenterology* 68(4):964, 1975.

6956 SERUM GASTRIN AND SECRETIN LEVELS AFTER THE EXALTO-MANN-WILLIAMSON PROCEDURE. *(E.)* Tasse, D. P.; Kolts, B. E.; Barefoot, S. W.; McGuigan, J. E.; Woodward, E. R.; Dragstedt, L. R. (Univ. Florida Coll. Med., Gainesville, Fla.). *Gastroenterology* 68(4):950, 1975.

6957 EFFECT OF AGING ON MUCOSAL ACYL-COA: MONOGLYCERIDE ACYLTRANSFERASE ACTIVITY. *(E.)* Masuda, M.; Hosoda, S.; Bamba, T.; Nakajo, S.; Nisino, H. (Kyoto Prefectural Univ. Med., Kyoto, Japan). *Gastroenterology* 68(4):947, 1975.

6958 OBSERVATIONS ON PLASMA RIA SECRETIN RESPONSES IN DOGS. *(E.)* Lee, K. Y.; Chey, W. Y.; Tai, H. H.; Hendricks, J. (Genesee Hosp., Rochester, N.Y.). *Gastroenterology* 68(4):934, 1975.

6959 INTESTINAL PHASE OF GASTRIC SECRETION. *(E.)* Knoturek, S. J.; Kaess, H.; Radecki, T.; Kwiecien, N. (Inst. Physiol., Cracow, Poland). *Gastroenterology* 68(4):928, 1975.

6960 METABOLIC MODIFICATIONS OF JEJUNUM ISOLATED FROM RATS KEPT IN CONTINUOUS LIGHT OR DARKNESS. *(Fr.)* Sadeghi Louyeh, A. (Faculte de Medicine, Universite de Teheran, Teheran, Iran). *J. Physiol. (Paris)* 70(1):111-114, 1975.

6961 FOLLOWING SMALL INTESTINE TRANSPLANTS BY CONSECUTIVE ASPIRATION BIOPSIES OF THE MUCOSA. *(Ger.)* Stauffer, U. G.; Mona, D.; Shmerling, D. H. (Univ.-Kinderklinik Zurich, Steinwiesstrasse 75, CH-8032, Zurich, Switzerland). *Z. Kinderchir. Grenzgeb.* 16(1):32-37, 1975.

6962 ADAPTATION OF DISACCHARIDE DIGESTION FOLLOWING EXTENSIVE RESECTION OF THE SMALL INTESTINE IN THE RAT. *(Pol.)* Bochenek, W. (Academy Medicine, Wroclaw, Poland). *Przegl. Lek.* 31(2): 340-344, 1974.

6963 INTESTINAL AMMONIUM PRODUCTION IN THE NORMAL RAT. COMPARISON OF THE EFFECTS OF ANTIBIOTICS AND LACTULOSE. *(Fr.)* Imler, M.; Peter, B.; Schlienger, J. L.; Lavillaureix, J.; Stahl, J.; Reeb, E.; Frick, A. (Centre Hospitalier Universitaire, F 67005 Strasbourg Cedex, France). *Med. Chir. Dig.* 4(1):15-20, 1975.

6964 CULTURES OF MUCOSA FROM THE SMALL INTESTINE. *(Fr.)* Rampal, P,; Delmont, J. (Centre Hepato-Gastroenterologie, 4, avenue Reine-Victoria, F 06100 Nice, France). *Arch. Fr. Mal. App. Dig.* 64(2):159-169, 1975.

6965 INTESTINAL RADIATION INJURY: THE LOWER BOWEL SYNDROME. *(E.)* Sullivan, M. F.; Ruemmler, P. S.; Beamer, J. L.; Mahony, T. D. (Biology Dept. Battelle Pacific Northwest Lab., Richland, Washington 99352). *Radiat. Res.* 62(3):579, 1975.

6966 CARBOHYDRATE DIGESTION AND ABSORPTION. ROLE OF THE SMALL INTESTINE. *(E.)* Gray, G. M. (Stanford Univ. Medical Sch., Stanford, Calif.). *N. Engl. J. Med.* 292(23):1225-1230, 1975.

6967 COMBINED IMMUNOSUPPRESSION IN SMALL-BOWEL ALLOTRANSPLANTATION IN THE DOG. *(E.)* Alberu, J.; Wolpert, E.; Chavez-Peon, F. (Dept. Cirurgia Experimental Instituto Nacional de la Nutricion, Mexico City, Mexico). *Transplant. Proc.* 7(1):775-778, 1975.

6968 EFFECTS OF ANTHRAQUINONE HETEROSIDES ON THE DIGESTIVE TRACT OF THE RAT: HISTOENZYMATIC STUDY. *(Fr.)* Wegmann, R. (Inst. Med. Histochem. Paris, France). *Ann. Histochim.* 19(2): 131-150, 1974.

See also, 6594, 6597, 6598, 6604, 6606, 6608, 6611, 6626, 6636, 6642, 6758, 6856, 6864, 7843, 7903.

GENERAL

6969 MICROCIRCULATION OF THE CAT STOMACH. *(E.)* Svanes, K.; Skarstein, A.; Svanes, T. (Dept. General Surgery, Univ. Bergen, Norway). *Eur. Surg. Res.* 7(1):53-64, 1975.

Carbonized microspheres (15 µm in diameter) were used for estimation of the microcirculation in different layers and regions of the cat stomach. ^{169}Yb, ^{85}Sr and ^{141}Ce-labeled microspheres (2-3 million) suspended in 0.3 to 0.5 ml of 10% dextran were injected into the left cardiac ventricle of anesthetized male and female cats. Cats were divided into groups of controls (receiving microspheres labeled with ^{85}Sr), a group with gastrin labeling with ^{169}Yb, followed by i.v. infusion of pentagastrin (0.15-0.30 µg/kg/min), then injection of ^{85}Sr-labeled microspheres; a norepinephrine group, labeled with ^{141}Ce, followed by an i.v. infusion of the drug (2 µg/kg/min), and then by injection of ^{85}Sr-labeled microspheres. The last two groups were laparotomized and a gastric ulcer was induced by 20% acetic acid (0.3 ml, s.c.), resp. The majority of labeled microspheres in the mucosa samples were found in the propria and in the glandular layer, with only a few in the submucosa. Muscularis samples showed the majority of the labeled spheres in muscle tissue, with only 1 to 9% present in the submucosa. In cats with ulcers, blood flow was markedly increased in both mucosa and muscularis samples in the ulcer region, due to high flow in the inflammatory granulation tissue. It is concluded that this method gives an accurate picture of capillary blood flow in the glandular layer of the mucosa and in the muscularis.

6970 PEYER'S PATCHES, GUT IgA PLASMA CELLS AND THYMIC FUNCTION: STUDY IN NUDE MICE BEARING THYMIC GRAFTS. *(E.)* Guy-Grand, D.; Griscelli, C.; Vassalli, P. (Hopital Necker-Enfants Malades, Paris 75015, France). *J. Immunol.* 115(2):361-364, 1975.

Experiments on nude mice were designed to correlate the effects of thymus grafting on development of Peyer's patches, frequency of intestinal mucosa immunoglobulin A (IgA) plasma cells, and serum IgA levels. Three to five thymus fragments obtained from 16- to 20-day-old BALB/c fetuses were placed in the peritoneal cavity of 8- to 10-week-old nude mice with BALB/c background. Controls were normal BALB/c mice. Immunofluorescent staining and ^{3}H-thymidine labeling of cell suspensions or tissue sections were used to detect intestinal IgA plasma levels and T lymphocytes. Serum IgA levels were determined by Laurell crossed electrophoresis. Thymus grafts to nude mice caused a steady increase in the percentages of mouse T lymphocyte antigen^{+} lymphocytes: 8-35% in the spleen, 16-57% in the peripheral lymph nodes, 15-48% in the mesenteric lymph nodes, and 8-15% in the Peyer's patches at 30 and 100 days, resp. The Peyer's patches of grafted nude mice when compared to ungrafted nude mice increased in size and could not be distinguished from those of normal BALB/c mice. They possessed well-developed germinal centers, large numbers of rapidly dividing cells, increased T lymphocyte populations in the interfollicular and germinal centers, increased numbers of intestinal IgA plasma cells and intraepithelial T cells of the intestinal mucosa, and higher serum IgA levels. Thus, thymus grafting has a pronounced effect on the development of Peyer's patches germinal centers and on the contents of the intestinal mucosa in IgA plasma cells. These findings may explain the association of thymic defects, low serum IgA, and lack of intestinal IgA plasma cells observed in some immunodeficiency syndromes of man.

6971 THE EFFECT OF SYMPATHETIC NERVE STIMULATION ON ACID SECRETION, REGIONAL BLOOD FLOWS AND OXYGEN USAGE BY STOMACHS OF ANAESTHETIZED CATS. *(E.)* Grund, E. R.; Reed, J. D.; Sanders, D. J. (Medical Sch., Univ. Newcastle upon Tyne, England). *J. Physiol.* 248(3):639-647, 1975.

To determine whether splanchnic nerve stimulation has a direct inhibitory effect on parietal cell activity, oxygen consumption and extraction by the stomach were measured in cats during gastrin pentapeptide stimulation with and without concomitant splanchnic nerve stimulation. The fasted, anesthetized animals were subjected to pylorus ligation, after which a catheter was passed into the pyloric antrum. Both vagus nerves were sectioned and the splanchnic nerves were cut extraperitoneally on both sides; ring electrodes were placed on the distal ends of the splanchnic nerves. Gastric activity was stimulated by i.v. gastrin pentapeptide (20 µg/10 min) and the splanchnic nerves were continuously stimulated (10 Hz) for two consecutive 10-min periods. Gastric acid output was measured by electrometric titration to pH 7 and the oxygen concentrations in the arterial and gastric venous blood were measured using an oximeter. Splanchnic nerve stimulation significantly reduced the acid output and total gastric and mucosal blood flows produced in response to maximal gastrin pentapeptide infusion. The arterial hemoglobin concentration was also significantly reduced during splanchnic nerve stimulation, and the total gastric oxygen consumption was significantly reduced during the periods when the mucosal blood flow and acid secretion were inhibited. The data indicate that oxygen consumption and acid secretion decline in parallel during splanchnic nerve stimulation, but that the percent oxygen extraction by the stomach does not change significantly. These findings support the hypothesis that splanchnic nerve stimulation directly inhibits parietal cell activity.

6972 SUBCELLULAR LOCATION AND THE EFFECTS OF VARIOUS HORMONE STIMULI ON ADENYLATE CYCLASE IN THE INTESTINAL MUCOSA OF THE GUINEA PIG. *(Fr.)* Bouhours, D.; Bouhours, J. F.; Lambert, R. (Edouard Herriot Hosp., Lyon, France). *Biol. Gastroenterol. (Paris)* 7(4):275-283, 1974.

Female albino guinea pigs underwent food deprivation (18 hr) prior to cervical dislocation. Intestinal mucosa homogenate adenylate cyclase activity was assayed with and without NaF, in nonpurified brush border preparation (BB+N), in purified brush border preparation (BBp), and in 2,000 *g* pellet from brush border preparation supernatants, the resulting sediment having been called MP. Through testing, MP seemed to be made of impure lateral and basal membranes, BBp, of microvillus membranes noncontaminated by mitochondria and microsomes. The effect of adenylate cyclase was sought in the three preceding preparations; the MP fraction demonstrated the most activity followed by BB+N and then by BBp. But when NaF was added, even the BBp could become active. The activation mechanism of adenylate cyclase was presumed to be one of steric modification. This would explain the behavior of BBp; the enzyme would stay under the control of its regulatory protein until stimulation by NaF. The high activity of MP was tested for the presence of a hormonal factor or for a partial dislocation of the membranous structure. Three factors have been known to stimulate adenylate cyclase: (1) NaF, (2) choleria toxin, and (3) prostaglandins. Other hormones tested *in vitro* proved ineffective in stimulating intestinal adenylate cyclase. It appears impossible to link any intestinal hormone on a cause and effect basis to the secretion of adenylate cyclase.

6973 COLONIZATION OF THE GUT OF "GNOTOXENIC" RATS AND MICE BY TEN STRAINS OF STRICTLY ANAEROBIC BACTERIA: INFLUENCE OF THE HOST AND ITS DIET. *(Fr.)* Ducluzeau, R.; Raibaud, P.; Ladire, M.; Riottot, M.; Chopin, A. (Natl. Center Zootechnological Res., Jouy-en-Josas, France). *Ann. Inst. Pasteur (Paris)* 124B(4):517-532, 1973.

Ten strictly anaerobic bacterium species (*Pasteurella vulgata, Veillonella alcalescens, Clostridium difficile, Acuformis perennis, Streptococcus intermedius, S. putridus, Eubacterium parvum, Ristella putredinis, Inflabilis mangenoti,* and *Zymobacterium* sp.), isolated from the guts of conventional rats, were seeded in cecumectomized and noncecumectomized germ-free Fischer rats and C3H mice. The animals were kept on conventional diet, on commercial diet with additional lactose, on cow's milk, or on a semi-synthetic diet composed of 580 g of corn starch, 220 g of casein, 90 g of corn oil, 1 g of chromium oxide, 50 g of cellulose, vitamins, and inorganic salts. *Pasteurella, Acuformis,* and *Veillonella* were dominant in noncecumectomized rats and mice, regardless of diet, while *Eubacterium* and *Clostridium* were usually present in the subdominant flora. *Ristella, S. putridus* and *Zymobacterium* were also present in the subdominant flora of the rats, but they were absent in mice fed an identical diet. *Inflabilis* did not persist in any subjects. The addition of lactose did not modify this equilibrium in mice, but semi-synthetic diet caused a fall in the population of most species. In mice fed only cow's milk, the final equilibrium was between that observed with commercial diet and with semi-synthetic diet. Cecumectomy resulted in a drop in the bacterial population of the stomach and of the small intestine, and in the number of *S. putridus* throughout the digestive tract.

6974 A CONTRIBUTION TO THE PHYSIOLOGY OF THE ISOLATED DOG PANCREAS—THE INFLUENCE OF THE ACTUAL BLOOD GLUCOSE LEVEL ON BLOOD CIRCULATION IN THE PANCREAS. *(Ger.)* Hempfling, H.; Husemann, B. (Chirurgische Universitats-Klinik, Nurnberg, Germany). *Arzneim. Forsch.* 25(6):916-918, 1975.

6975 PLASMA CONCENTRATION OF ZINC AND COPPER AFTER INTESTINAL SHORT CIRCUIT. *(Fr.)* Montorsi, W.; Annoni, F.; Doldi, S. B.; Germiniani, R.; Longoni, F. (Greater Polyclinical Hosp., Univ. Milan, Milan, Italy). *Nouv. Presse Med.* 4(23):1734, 1975.

6976 THE EFFECT OF THE EPITHELIAL CELLS OF THE INTESTINAL MUCOSA, THEIR SUBCELLULAR CULTURES AND COMPLEMENT ON THE VIABILITY OF CHOLERA BACILLUS. *(Rus.)* Adamov, A. K.; Klassovskaia, T. L. (Natl. Mikrob. Anti-plague Inst., Saratov, USSR). *Zh. Mikrobiol. Epidemiol. Immunobiol.* 52(1):138-139, 1975.

6977 STUDIES OF LOCAL AND CERTAIN GENERAL IMMUNOLOGICAL REACTIONS USING THE MODEL OF EXPERIMENTAL DYSENTERIC ENTEROCOLITIS IN GUINEA PIGS. *(Rus.)* Miroliubova, L. V.; Blinova, N. I.; Petrovskaia, V. G. (Gamaleia Inst. Epidemiol. Microbiol., Moscow, USSR). *Zh. Mikrobiol. Epidemiol. Immunobiol.* 52(1):123-124, 1975.

6978 SUSCEPTIBILITY OF GUINEA PIGS UNDER STRESS TO PERORAL INFECTION BY Shigella sonnei. *(Rus.)* Balashov, M. P. (Leningrad Inst. Vaccines Sera, Leningrad, USSR). *Zh. Mikrobiol. Epidemiol. Immunobiol.* (1):137-138, 1975.

6979 PROBLEMS IN THE HORMONAL REGULATION OF GASTROINTESTINAL FUNCTION. *(Rus.)* Klimov, P. K. (I. P. Pavlov Inst. Physiology, Leningrad, USSR). *Ter. Arkh.* 47(2):129-136, 1975.

6980 RADIOMETRIC AMINOPYRINE CLEARANCE TECHNIC FOR DETERMINING GASTRIC MUCOSAL BLOOD FLOW. *(E.)* Tague, L. L.; Jacobson, E. D. (Univ. Texas Med. Sch., Houston, Tex.). *Gastroenterology* 68(4):995, 1975.

6981 PROGNOSIS OF THE OUTCOME AND DIAGNOSIS OF PARATYPHOID B IN MICE BY THE ENZYMATIC STATUS OF LYMPHOCYTES AND NEUTROPHILS. *(Rus.)* Katosova, L. K.; Katosova, R. K.; Levina, L. A.; Nartissov, P. (Mechnikov Inst. Vaccines Sera, Moscow, USSR). *Zh. Mikrobiol. Epidemiol. Immunobiol.* (1):75-80, 1975.

6982 THE ROLE OF BLOOD OUTFLOW DISORDERS IN GASTRIC DISEASE. *(Rus.)* Norkunas, P. I.; Lapinskas, V. I. (Dept. Hosp. Surgery, V. Kapsukas Univ., Vilnius, USSR). *Ekspr. Khir. Anestesiol.* (1):33-36, 1975.

6983 PEYER'S PATCHES AND CELLULAR IMMUNITY. *(Fr.)* Eloy, R.; Vuitton, D.; Garaud, J. C.; Vaultier, J. P.; Klein, M.; Grenier, J. F. (INSERM U-61, avenue Moliere, F 67200 Strasbourg-Hautepierre, France). *Biol. Gastroenterol. (Paris)* 8(1):73-86, 1975.

6984 IN VITRO COMPARATIVE EVALUATION OF TINIDAZOLE AND METRONIDAZOLE ON STRAINS OF Entamoeba histolytica. *(E.)* MaHajan, R. C.; Chitkara, N. L.; Vinayak, V. K.; Dutta, D. V. (Postgrad. Inst. Med. Educ. Res., Chandigarh, India). *Indian J. Pathol. Bacteriol.* 1/(4):226-228, 1974.

See also, 6780.

DIAGNOSTIC PROCEDURES

6985 AZYGOGRAPHY IN ESOPHAGEAL CANCER. *(Sp.)* Sans Segarra, M.; Curto Cardus, J.; Jori Sole, X.; Olazabal, A. (Principes de Espana Munic. Hosp., Barcelona, Spain). *Rev. Esp. Enferm. Apar. Dig.* 42(6):685-698, 1974.

Azygography is recommended for the selection of patients with operable esophageal tumors for surgery. After patients are fasted for 6-8 hr, a sedative is administered 1 hr before examination. With the patient in a prone position, a chest x-ray is taken. Then a local anesthetic (3-5 ml mepivacaine containing 1% epinephrine) is injected as far as the periosteum at the level of the 10th rib and posterior axillary line on the right side for the azygos major and on the left for the azygos minor. When the area is sufficiently anesthetized, a trochar is inserted so that contrast medium can be injected into the intercostal vein after more local anesthetic has been administered. It is recommended that the procedure be monitored on a television screen. Iodamide (15-20 ml) is injected as rapidly as possible, x-rays are taken during injection of the last ml of contrast medium, and changes in the azygogram are studied as the patient performs the Valsalva manuever. This demonstrates any delay in flow in the azygous system. Since some patients have normal findings on one side and a block at a distance from the tumor on the other, indicating the presence of lymph node metastases, bilateral examinations should by performed routinely. Marked reflux is considered indicative of hypertension in the azygous system which results from a block at some level in its path. In about 10% of the patients examined, thoracoaxillary collaterals were observed without any sign of hypertension. Few complications occurred. One patient developed pneumothorax and another was hypersensitive to the contrast medium; both complications resolved rapidly and spontaneously. In some patients, contrast medium diffused through soft tissues and the patients developed inflammatory tumefactions and pain which lasted 5-7 days. Local heat and antiinflammatory ointment produced reabsorption.

6986 THE BUDD-CHIARI SYNDROMES: RADIOLOGIC DIAGNOSIS. *(Fr.)* Bigot, J. M.; Chermet, J.; Monnier, J. P. (Hopital St. Antoine, Paris, France). *Ann. Radiol. (Paris)* 17(5):451-469, 1974.

The Budd-Chiari syndrome was defined as a secondary obstruction of the hepatic veins, the diagnosis of which was made by radiographic and phlebographic studies. Fifty patients (mean age 30 yr) were observed over the past 18 yr. The clinical aspects which brought the patients to the hospital were the following: possible decompensated hepatic cirrhosis with edema of the lower extremities or hepatomegaly. Absence of any etiology to this pseudo-cirrhotic syndrome as well as the observation of a collateral basithoracic, presternal and epigastric circulation were of high value. The existence of polycythemia and the use of laporophotography proved essential in the diagnosis. The methods used in this study were precise and sequential: inferior cavography, catheterization of the right heart, tentative selective retrograde catheterization of the hepatic veins and transhepatic transcutaneous venography (VTH), the latter being a precise technique with few risks. This was followed by selective arteriography of the celiac trunk and the superior mesenteric artery. The VTH seemed to be the only radiologic exam which would actually prove the syndrome. Three types of pictures were obtained through VTH: no opacification of the right hepatic vein, total ostial obstruction and dilatation with stasis in the hepatic veins. The overall arteriograph show increased density of the caudal lobe, hypervascularization of the right diaphragmatic dome, and hepatic hypervascularization. The results are confirmed by surgery.

6987 BARIUM OR GASTROGRAFIN: WHICH CONTRAST MEDIA FOR DIAGNOSIS OF ESOPHAGEAL TEARS? *(E.)* James, Jr., A. E.; Montali, R. J.; Chaffee, V.; Strecker, E. P.; Vessal, K. (Johns Hopkins Med. Inst., Baltimore, Md.). *Gastroenterology* 68(5): 1103-1113, 1975.

The effects of barium sulfate, alone and in combination with normal esophageal flora, on the mediastinum were compared with those of meglumine diatrizoate, a water-soluble contrast-medium. Twenty-nine domestic adult cats were divided into groups: operative controls, barium, meglumine diatrizoate, flora, meglumine diatrizoate plus flora, and barium plus flora. A total volume of 1 ml of substance was instilled into the mediastinum of each cat. The animals were sacrificed at serial time intervals following mediastinal injection. The water-soluble contrast media caused no significant histological reaction. Barium caused granuloma formation but had no additional deleterious effects when mixed with flora. Barium, due to its superior physical properties of mucosal coating and radiographic density, should be employed as the contrast agent of choice in difficult clinical problems with regard to esophageal tears. As a practical compromise, it is suggested that in patients with suspected tear of the esophagus, a limited upper gastrointestinal series with a water-soluble contrast agent be obtained. If this initial study is negative, it should then be repeated using barium as the contrast medium.

6988 EVALUATION OF CARBON-11 LABELLED PHENYLGLYCINE AND PHENYLALANINE FOR PANCREAS SCINTIGRAPHY. *(E.)* Vaalburg, W.; Beerling-van der Molen, H. D.; Woldring, M. G. (Academic Hosp., Univ. Groningen, The Netherlands). *Nucl. Med.* 14(1):60-66, 1975.

The tissue distribution of DL-α-phenylalanine-1-^{11}C and DL-α-phenyl-glycine-1-^{11}C in rats was studied, and the uptake of these compounds by the pancreas and liver was compared with the accumulation of L-selenomethionine-^{75}Se and ^{18}F-labeled amino acids. About 1 mg of the labeled amino acids were injected into the femoral veins of male Wistar rats under light anesthesia and the rats were killed at various intervals thereafter. The radioactivity in a blood sample taken before killing and in the liver, spleen, kidneys, and pancreas was determined. Based on the results, the ratios of the concentrations in the pancreas and liver were calculated and compared with the corresponding ratios reported in the literature for some ^{18}F-labeled aromatic amino acids and L-selenomethionine-^{75}Se. The results indicated that DL-α-phenylglycine-1-^{11}C, in spite of a small percentage of the administered dose reaching the pancreas, and DL-α-phenylalanine-1-^{11}C are better suited for pancreas scintigraphy than is L-selenomethionine-^{75}Sc.

6989 THE STATUS OF AND INDICATIONS FOR CELIOMESENTERIC ARTERIOGRAPHY IN GASTROINTESTINAL BLEEDING OF PANCREATIC ORIGIN.

(Fr.) Vankemmel, M. (Municipal Hosp., Lille, France). *Ann. Chir.* 27(6): 642-651, 1973.

The value and indications of celiomesenteric angiography in the diagnosis of gastrointestinal hemorrhages of pancreatic origin are presented on the basis of a patient material. Aneurysms of the splenic artery, intrahepatic arteries, localized dorsal pancreatic aneurysms, splenic and gastroduodenal arterial and arteriolar aneurysms, and pancreatico duodenal cirsoid aneurysms were diagnosed by celiomesenteric angiography in gastrointestinal bleedings of pancreatic origin. Preoperative arteriography permits logical surgical procedure adapted to the individual case, thus avoiding unnecessary gastric mutilation. In pancreatopathies, celiomesenteric arteriography furnishes information on the splenomesenterico-portal venous axis and on arterial lesions that may exist concurrently with venous involvement. Angiography provides a morphological picture indispensable for exploration for chronic pancreatitis, pseudocysts, or late evolutive complications of acute pancreatitis. Small opaque pseudo-aneurysms are pathognomonic of arterial erosion.

6990 MESENTERIC ANGIOGRAPHY IN INFLAMMATORY DISORDERS OF THE SMALL INTESTINE AND MESENTERIC INFARCTION.

(Ger.) Dombrowski, H.; Pemsel, H. K. (Univ. Med. Clin., Marburg, Germany). *Radiologe* 14(9):415-424, 1974.

The value of mesenteric angiography for diagnosis and differential diagnosis in inflammatory disorders of the small intestine, such as Crohn's disease, malabsorption syndrome, collagen diseases, and mesenteric infarction is discussed. Angiography in Crohn's disease is suitable for preoperative determination of activity in the small and/or large intestines, for the preoperative detection of adhesions and loop conglomerates, for differentiation between vascular process and lymphosarcoma in atypical forms of Crohn's disease, between Crohn's disease and ischemic colitis, and for the differential diagnosis of colitic stricture. Arterial hypervascularization, intense wall contrast, premature venous reflux, conspicuous distance between the inner contrasted wall layers and the subserous arteries, and transposition of higher intestinal arteries are the diagnostic features of different stages of Crohn's disease. Angiography can be used as an auxiliary diagnostic tool in certain special clinical cases of malabsorption syndromes. Angiography is valuable in the diagnosis of collagenoses, especially of periarteritis nodosa, which features irregularities in the vessel diameters, thrombotic occlusions, and miliary aneurysms of the medium and small arteries of the kidneys and of the gastrointestinal tract. In acute embolism of the superior mesenteric artery, angiography helps differentiate between acute proximal obturation and embolism in the peripheral branches. It is possible to localize the obturation, and to demonstrate a possible collateral perfusion. Reduced flow in the superior mesenteric artery, possible reflux into the aorta, and delayed or reduced filling of the peripheral section of the artery are found in thrombosis in the mesenteric vein.

6991 NEW TEST FOR PANCREATIC EXOCRINE FUNCTION: JEJUNAL PERFUSION OF AMINO ACIDS.

(Fr.) Ertan, A. (Departement de Gastroenterologie, Faculte de Medecine, Universite d'Ankara, Turquie). *Arch. Fr. Mal. App. Dig.* 64(2):107-114, 1975.

A jejunal perfusion of amino acids (JPAA) determined a release of cholecystokinin-pancreozymin (CCK), the effects of which were comparable to administration of a full dose of this hormone. Eight chronic pancreatitis patients, all alcoholics having an exocrine pancreatic secretion deficiency, and eight healthy controls were selected. Two probes (I and II, resp.) were placed at 40 cm below the duodenal junction (distal to the ligament of Treitz) and at the level of the fourth part of the duodenum. Probe I was subdivided into two smaller probes (A and B): probe A was used as a radio-opaque indicator; probe B was used to perfuse a mixture of amino acids. Probe II was subdivided into four smaller probes (C, D, E and F): C aspirated duodenal fluid, probe D insufflated air to facilitate probe C's work, probe E was used to perfuse a phenol solution (a nonabsorbed marker), and probe F aspirated gastric juices so that pancreatic juices would not be stimulated by acidification of the duodenum. Duodenal liquid was collected every 15 min on all 16 subjects and the pH, volume, bicarbonate concentration, trypsin, amylase, lipase, total protein, biliary acid and bilirubin levels were measured. The levels of the two latter were identical in both groups, suggesting that endogenous liberation of CCK stayed normal in chronic pancreatitis patients; all the other measured elements had lower levels for the CP group. This method may be of value in situations in which stimulation of the pancreas is desired.

6992 LIVER BIOPSY WITH GUIDANCE IN SCANNING. A PRELIMINARY REPORT.

(E.) Erasmie, U. (Karolinska Sjukhuset, S-104 01 Stockholm, Sweden). *Acta Radiol.* [*Diagn.*] *(Stockh.)* 16(1):49-53, 1975.

A method of introducing the biopsy instrument into the liver under fluoroscopic control for the use in liver scanning is presented. The method calls for scanning of the liver by a scintillation camera with a persistence oscilloscope. Following the i.v. administration of 2 mCi of ^{99m}Tc sulfur colloid, recordings are made in a.p., p.a. and lateral projections. Rings of metal of high radiation absorption serve as indicators. The ring is carefully adjusted to a position right above the lesion on the liver. Leaving the patient in an unchanged position, the head of the gamma camera is revolved and the location of the lesion is determined. In direct comparison with the known ring diameter, estimations of dimensions can be made on liver scan in levels paralled to the ring. Thus, the diameter of a lesion with a reduced isotope uptake may be determined and the size of the liver be approximated. Liver biopsy is performed with the patient in the same position as during the indication of the lesion. The biopsy instrument is inserted from a suitable position, usually the right side, horizontally at level with the center of the side ring. Under fluoroscopic control the instrument is introduced into the liver. The point of the needle should then be positioned centrally in the region of reduced isotope accumulation to permit sampling of tissue material. This technique was applied in 19 patients with the following results: the diameter of the lesion was between 3 and 6 cm in eight cases, 6 and 9 cm in eight cases, and more than 9 cm in three cases; cytology revealed carcinoma cells in ten patients; in five cases normal liver tissue was obtained. The results for the remaining four patients consisted of: a distended gallbladder with a stone in its neck; a case of biliary obstruction; a local, radiation-induced hepatitis; and a case in which diagnosis was uncertain. No complications in connection with the biopsies were encountered. It is concluded that liver scanning is a useful screening method of high accuracy.

6993 INDICATIONS FOR AND VALUE OF ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY. *(Ger.)*

Halter, F. (Inselspital, CH-3010 Bern, Switzerland). *Schweiz. Med. Wochenschr.* 105(15):476-480, 1975.

In a 2.5 yr period, retrograde cholangiopancreatographic (ERCP) examinations were performed on 159 patients. Premedication consisted of diazepam (5-20 mg i.v.) or mependine hydrochloride (1 mg/kg), either alone or combined with 5-10 mg diazepam. The papilla of Vater was seen in seven of the first 10 examinations, but duct systems were catheterized in only two cases (20%). With increasing experience it was possible to catheterize 85% of the last 130 patients. In 17 of the 32 cases in which catheterization could not be performed, it was impossible to see the papilla; the catheter slipped away in seven, three patients were uncooperative, and extravasation of the contrast medium occurred in two. In one case each, there was a Billroth II gastroenterostomy, a papillary carcinoma, and a nonfasting patient. The mean time required to perform RCP examinations was 54.4 min. In the 127 cases in which it was possible to introduce the catheter, both duct systems were visualized in 58 cases (43.3%), only the pancreatic duct in 44 (34.0%), and only the bile duct in 25 (19.6%). Diagnoses were established in 41 (73.1%) of 56 patients with clinical signs of biliary disease, in 15 (65.2%) of 23 patients suspected of having biliary and pancreatic disease, and in 48 (60.9%) of 80 patients suspected of pancreatic disease. In the 104 cases in which a diagnosis was established, findings were normal in 50 (31.4%) and pathological in 54 (34%). With the use of ERCP, the following findings were made: chronic pancreatitis in 20 cases, choledocholithiasis (16), pancreatic carcinoma (6), biliary carcinoma (2), papillary carcinoma (2), postoperative stenosis of the bile duct (1), papillary stenosis (2), cholecystolithiasis (2), insufficiency of the duodenal stump following a Billroth II procedure and cholecystectomy (1), and postcholecystectomy syndrome resulting from cutting of the right hepatic duct (1).

6994 COMPLICATIONS OF ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY: ANALYSIS OF 300 CONSECUTIVE CASES. *(E.)*

Zimmon, D. S.; Falkenstein, D. B.; Riccobono, C.; Aaron, B. (Manhattan Veterans Administration Hosp., New York, N.Y.). *Gastroenterology* 69(2):303-309, 1975.

Complications of endoscopic retrograde cholangiography were reviewed in 300 consecutive attempts at the procedure in 278 patients. In 79%, either the pancreatic and/or bile ducts were opacified. Retrograde pancreatograms were obtained in 192 cases and retrograde cholangiograms in 141 cases. In all there were 15 complications, a 5% incidence. In 62 cases, neither duct was opacified. Seven complications were drug-related, including behavioral disturbances in five, choking with emesis in one, and respiratory depression in one. Brief, self-limited pancreatitis after retrograde pancreatography occurred in five of 90 patients with pancreatic disease. Three patients developed septicemia within 72 hr after the procedure. In 85 cases, the procedure was performed in the absence of extrahepatic biliary disease; there were no complications. In 56 cases where the procedure showed extrahepatic pathology, three cases of sepsis occurred, a statistically significant increase in incidence. It is concluded that the procedure has no absolute contraindications, and compares favorably with other equally useful procedures.

6995 ACCURACY OF ULTRASOUND IN DIAGNOSING ABDOMINAL MASSES. *(Eng.)*

Richardson, R.; Norton, L. W.; Eule, J.; Eiseman, B. (Denver General Hosp., Denver, Colo. 80204). *Arch. Surg.* 110(8):933-939, 1975.

Over a 7-yr period, B-mode ultrasonography was performed in 246 patients with suspected abdominal masses. The accuracy of the ultrasonic diagnosis was evaluated in 105 (43%) of the cases, and proven correct in 60 (57%) of these 105. Of the remaining 141 patients, those who did not undergo surgery and whose diagnoses had been established by other means, the ultrasonic diagnosis agreed with the clinical diagnosis in 69 cases (31%). As confirmed by surgery, the accuracy of the ultrasonic diagnosis was highest for splenic masses (100%) and for aortic aneurysm (88%). In 56% of the patients, liver masses were correctly identified; gallbladder lesions were identified correctly in 38%. In diagnosing pancreatic disease, a 48% accuracy was obtained, but 64% of all pseudocysts were localized. In 56% of the renal masses, ultrasonography correlated positively. In 61% of the patients, abscess was accurately diagnosed. However, retroperitoneal adenopathy was correctly diagnosed in only 33%. It is concluded that abdominal ultrasonography, while accurate in diagnosing splenic and aortic masses, did not identify more than half of the other mass lesions. It is suggested that improvements in technique should upgrade the accuracy of this diagnostic tool.

6996 THE POSITION OF ECHOTOMOGRAPHY IN GASTROENTEROLOGY AND HEPATOLOGY: PRELIMINARY STUDY OF 135 CASES. *(Fr.)* Dofing, J. L. (No affiliation given). *Rev. Fr. Gastroenterol.* (103): 65-66, 68, 70-71, 1974.

Echotomography may be used in parellel with the clinical exam or to complement radiologic, scintigraphic or ultrasonic investigations. A total of 135 patients were studied and classified into three groups: those suffering from (1) palpable abdominal tumors (hepatomegaly without associated icterus or other palpable tumor); (2) jaundice with or without hepatomegaly or; (3) undetermined ailments without palpable mass or icterus. Forty-six hepatomegaly (without icterus) patients had confirmed diagnosis by this method. When used by a trained echotomographist, the technique could make or confirm a diagnosis without subjecting the patient to further, possibly more dangerous, tests (e.g., aortography for diagnosis of aneurysms in the abdominal aorta). Echotomography helped determine to which organ a palpable mass belonged. In 90% of the cases echotomography determined whether it was a liquid or a solid tumor and its exact location. Studying 17 patients with retention jaundice, correctness of diagnosis was as follows: 36%, exact disgnosis; 41%, indirect information; 33%, failure to diagnose (60% appropriate answers). Echotomography should fall into the routine exam for jaundice. In the last 18% of the studied population when echotomography was used after an ultrasonic or radiologic test, precise diagnoses were established. In conclusion, it seems the best use for this technique is in the exploration of abdominal tumors, palpable or not, and in searching for collected fluids.

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See also, 7092, 7163, 7164, 7165, 7166, 7174, 7178, 7239, 7320, 7349, 7351, 7424, 7429, 7430, 7431, 7440, 7448, 7526, 7530, 7579, 7606, 7611, 7622, 7666, 7669, 7687, 7718, 7740, 7747, 7762, 7764, 7765, 7768, 7782, 7783, 7784, 7785, 7796, 7805, 7832, 7834, 7878, 7879, 7881, 7886, 7913, 7929, 7934, 7997.

GASTROINTESTINAL DISEASES

ESOPHAGUS

7069 MEASUREMENTS OF TRANSMUCOSAL POTENTIAL DIFFERENCE IN THE OESOPHAGUS, STOMACH AND DUODENUM UNDER ENDOSCOPIC CONTROL. *(E.)* Barbara, L.; Miglioli, M.; Di Febo, G.; Baldi, F.; Biasco, G.; Corinaldesi, R. (Dept. Internal Medicine, Gastroenterology, Univ. Bologna, Italy). *Rend. Gastroenterol.* 7(1):10-15, 1975.

Transmucosal potential differences were measured in organic lesions of the esophageal, gastric, and duodenal mucosa during endoscopy, and correlation of the results with the endoscopic and histologic appearance of the mucosa was attempted. Of 60 subjects, eight were apparently normal, seven had gastric ulcer, 14 had duodenal ulcer, four had gastric cancer, nine had chronic superficial gastritis, 15 had chronic atrophic gastritis, and one had dermatosclerosis. Exploratory electrodes were introduced *via* gastroduodenoscope and placed in direct contact with the mucosa, and reference electrodes were placed in contact with peripheral venous blood. At least 30 readings were taken per subject at various points (at least two readings per point). Three direct vision biopsy samples were taken from the stomach of each patient; basal and peak acid outputs were determined after pentagastrin stimulation. Controls showed mean potential differences for the esophagus, corpus and fundus, antrum and duodenum of -12.7, -45.48, -28.14, and -9.34 mV, resp. In the gastric ulcer patients, values were -10.56 mV at the level of the ulcer crater and -12.51 mV at the crater edge. Values of the corpus (-33.41 mV) and antrum (-19.0 mV) were significantly lower than control values. In the duodenal ulcer patients, values at the level of the crater were -4.58 mV and -5.3 mV at the crater edge. Values were also significantly lower than normal in the antrum and corpus. The dermatosclerosis patient had low values, except in the esophagus. Values were lowest at the angulus in which several non-bleeding erosions were present. The four gastric cancer patients had infiltrating and vegetating adenocarcinoma (ulcerated in one case) and infiltrating ulcerous carcinoma (two cases). Values were -13, -15, -5.5, and -6.5, resp. In the ulcerated zone, values went as low as -3 mV. Normal surrounding mucosa gave values ranging from -18.0 to -24.4. Histological examination showed grade 6 chronic atrophic gastritis in three cases, and grade 4 to 5 in the other case. No definite correlations of potential differences with endoscopic and histologic appearance were made.

7070 ESOPHAGEAL COLUMNAR EPITHELIAL β-GALACTOSIDASE AND β-GLUCURONIDASE. *(E.)* Berenson, M. M.; Herbst, J. J.; Freston, J. W. (Univ. Utah Coll. Medicine, 50 North Medical Drive, Salt Lake City, Utah 84132). *Gastroenterology* 68(6):1417-1420, 1975.

The activity of the lysosomal enzymes β-galactosidase and β-glucuronidase were compared in esophageal columnar, gastric fundic, and small intestinal epithelia. Esophageal biopsies were taken from four patients with midesophageal stricture and one patient with a deep esophageal ulcer. Gastric fundic and small intestinal tissue were obtained from patients undergoing endoscopy or peroral intestinal biopsy. All biopsy samples were homogenized. The mean β-galactosidase activity (as assayed using *p*-nitrophenyl-β-galactoside) in 10 gastric biopsies was 21.5 μmoles/g/hr; in eight small intestinal biopsies the mean was 28.9; in esophageal columnar epithelium the mean was 16.3. β-Galactosidase activity of gastric tissue was significantly less than the small intestine. Similarly, esophageal columnar epithelium was significantly less than small intestinal tissue, but did not differ from gastric tissue. The mean β-glucuronidase activity (as assayed with *p*-chloromercuribenzoate) in 10 gastric biopsies was 23.3 μmoles/g/hr; in seven small intestinal specimens the mean was 44.6; and in esophageal columnar epithelium the mean was 50.8. β-Glucuronidase activity in gastric tissue was significantly less than both small intestinal and esophageal columnar epthelium. Small intestinal and esophageal columnar epithelium did not differ significantly. It is concluded that esophageal columnar epithelium has enzyme characteristics which are dissimilar to both gastric fundic and intestinal tissue. This tends to corroborate previous findings of a structural and functional dissociation and suggests a metaplastic derivation.

7071 CAUSTIC STRICTURES OF THE OESOPHAGUS. *(E.)* Skene-Smith, H. (Dept. Radiology, Univ. Malaya, Kuala Lumpur, Malaysia). *Br. J. Radiol.* 48(572):646-648, 1975.

The radiological features of caustic strictures of the esophagus were studied in 16 females and six males aged 15-62 yr. The ages at caustic ingestion ranged from 1-45 yr, the ingestion being suicidal in nine cases. The structures were classified according to location (upper, middle, or lower third of the esophagus) and type (annular, short segment [less than 1/2 in. in length], and long segment). The lower third of the esophagus was involved in all the long segment strictures (16), but with sparing of the extreme distal portion in most cases. Irregularity of the stricture walls with an appearance similar to that reported in cases of intramural diverticulosis was a common finding (12 patients), but smooth strictures were also observed. Annular strictures (five) were noted with equal frequency in all portions of the esophagus, while short segment strictures (three) were noted only in the upper two-thirds. Of five long segment strictures involving the entire length of the esophagus, all had irregular walls. Dysphagia, chronic inflammation, and raised intraluminal pressure were present in patients with caustic strictures.

7072 THE ADVERSE EFFECT OF CHOCOLATE ON LOWER ESOPHAGEAL SPHINCTER PRESSURE. *(E.)* Wright, L. E.; Castell, D. O. (U.S. Naval Hosp., Philadelphia, Pa.). *Am. J. Dig. Dis.* 20(8):703-707, 1975.

The effect of chocolate on decreasing the lower esophageal sphincter (LES) pressure was studied in nine normal adult males using intraluminal end hole catheters. The responses to chocolate alone and to chocolate combined with agents known to increase LES pressure were evaluated. After basal LES pressure determinations, 120 ml of chocolate syrup mixed with 120 ml of distilled water was given p.o. to the subjects, who had fasted overnight. LES pressures were monitored for 1 hr. Mean pressure dropped from a basal level of 14.6 to a low of 7.1 mm Hg. On a subsequent day the subjects were given the same chocolate dose after basal recordings, and 15 min later were given 15 ml of a commercial antacid containing $Mg(OH)_2$-$Al(OH)_3$. Pressures were recorded for 1 hr after chocolate administration. Mean pressure dropped from a base of 13.3 to a low of 7.3 mm Hg at 15 min. On a third day the same dose of chocolate was given simultaneously with 25 mg of p.o. bethanechol. Four subjects were given 5 mg of bethanechol s.c. instead. With p.o. bethanechol, mean LES pressure dropped from a basal level of 18.4 to a low of 8.7 mm Hg at 15 min. With s.c. bethanechol, no decreases in pressure were observed; however, increases from a basal level of 16.5 to a peak of 25.3 mm Hg were seen at 30 min. Significant decreases in LES pressures after chocolate ingestion was demonstrated, confirming previous results by these authors. The results imply that neither antacid nor p.o. bethanechol administration reverses the action of chocolate in lowering LES pressure. However, s.c. bethanechol did reverse the LES pressure-lowering effect of chocolate.

7073 EFFECT OF PROSTAGLANDIN E_2 ON ESOPHAGEAL MOTILITY IN MAN.

(E.) Mukhopadhyay, A.; Rattan, S.; Goyal, R. K. (Baylor Coll. Medicine, Houston, Tex. 77025). *J. Appl. Physiol.* 39(3):479-481, 1975.

The effects of prostaglandin E_2 (PGE_2) on upper and lower esophageal sphincter pressures and on esophageal motility were studied in 12 normal adults, using intra-esophageal catheters. The luminal pressures were measured with three water filled side hole catheters glued together; the holes were 2.5 cm apart. The middle hole was placed at the sphincter, and pressures were recorded at 1 min intervals. A solution of 750 μg of PGE_2 in 150 ml of 5% dextrose was given by continuous i.v. infusion in varying, randomized doses over 5 min (doses were 30 min apart). The effect on lower esophageal sphincter (LES) pressure was measured in five subjects. The mean percent pressure fall at 5 min was 8.5, 21.3, 33.0, 61.6 and 52.0 for doses of 0.05, 0.1, 0.2, 0.4 and 0.8 μg/kg/min, resp. The effect on upper esophageal sphincter (UES) pressure was measured in three subjects, using doses of 0.4 and 0.8 μg/kg/min; no significant fall in pressure was observed. Peristalsis was studied with the catheter openings 10 cm apart so as to position them in the upper, middle and lower parts of the esophagus; peristalsis was initiated by dry swallows. Five subjects were studied using continuous infusion of PGE_2. Resting pressures were unaffected. The amplitude of contractions in the upper portion was unchanged, but was "significantly reduced" in the lower and middle esophagus. The speed of peristalsis was 4.9 cm/sec *versus* 3.6 cm/sec in the upper half and 5.4 *versus* 6.2 cm/sec in the lower half during dextrose infusion and PGE_2 infusion, resp. It is suggested that PGE_2 may selectively influence smooth muscle motor function in the esophagus. PGE_2 caused a dose-dependent reduction in LES pressure but did not affect UES pressure. The authors also suggest that PGE_2 reduces the amplitude of peristaltic contractions in the lower part of the esophagus.

7074 PRESSURE, TENSION, AND FORCE OF CLOSURE OF THE HUMAN LOWER ESOPHAGEAL SPHINCTER AND ESOPHAGUS.

(E.) Biancani, P.; Zabinski, M. P.; Behar, J. (Yale Univ. Sch. Medicine, New Haven, Conn. 06510). *J. Clin. Invest.* 56(2):476-483, 1975.

The influence of probe diameter on lower esophageal sphincter (LES) pressure and force of closure was studied, and the tension developed by the human LES and esophageal circular muscle was examined *in vivo*. Pressure and diameter characteristics were determined in 14 normal controls and in 19 patients with reflux esophagitis by the separate and random introduction of single motility catheters, attached to a plexiglas "olive" (0.25-1.0 cm in diameter). LES pressure in normal subjects was higher with the 0.25 cm olive, lower with the 0.5 cm olive, and gradually increased with the 0.75 and 1.0 cm olives. LES pressure in esophagitis patients remained low at all olive diameters. LES pressures were significantly different when measured pressures of competent and incompetent sphincters were compared at various probe diameters. Competent sphincters showed pressure differences only with probes between 0.50 and 0.75 cm. LES pressure increased at all probe diameters after successful fundoplication. Administration of the auticholinergic Pro-Banthine caused the pressure-diameter curves for competent sphincters to approximate those of patients. Urecholine stimulated pressures of incompetent sphincters and the pressure-diameter curves became similar in magnitude and shape to those of competent sphincters. Peak esophageal pressures in response to swallowing increased with larger probe diameters. The length-tension relation of the circular muscle increased continuously as the diameter increased for both competent and incompetent sphincters. Force and tension curves were similar in both types of sphincter. It is concluded that competent and incompetent sphincters have distinctly different pressure-diameter characteristics.

7075 CORRELATION OF LOWER ESOPHAGEAL SPHINCTER PRESSURE AND SERUM GASTRIN LEVEL IN MAN.

(E.) Wright, L. F.; Slaughter, R. L.; Gibson, R. G.; Hirschowitz, B. I. (Veterans Administration Hosp., Birmingham, Ala. 35233). *Dig. Dis.* 20(7):603-606, 1975.

The relation between lower esophageal sphincter (LES) pressure and simultaneous serum gastrin level was studied in 35 consecutive patients. Of these, seven served as controls; nine had gastroesophageal reflux and hiatus hernia (Group I), and the remaining 19 had no symptoms of reflux (Group II). Group II included eight patients with dysphagia, seven with chest pain, three with abdominal pain and one with persistent vomiting. Hiatus hernia was present in five Group II patients (IIA) and was not present in 14 Group II patients (IIB). The LES pressure of Group I was significantly lower (9.7 cm H_2O) than that of groups IIA (36.8) and IIB (25.6). The serum gastrin levels were not significantly different (129, 74 and 116 pg/ml, resp.). There was no correlation between individual LES pressure and individual serum gastrin level. In patients with abnormalities either of serum gastrin levels or the LES, there was no relation between these two factors. It is concluded that gastrin has no major physiologic role in the maintenance of sphincter tone.

7076 COMPARATIVE EFFECTS OF METOCLOPRAMIDE AND BETHANECOL ON LOWER ESOPHAGEAL SPHINCTER PRESSURE IN REFLUX PATIENTS.

(E.) McCallum, R. W.; Kline, M. M.; Curry, N.; Sturdevant, R. A. L. (Veteran's Admin. Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterology* 68(5):1114-1118, 1975.

The effects of p.o. metoclopramide (10 and 20 mg), bethanecol (25 mg) and placebo on lower esophageal sphincter (LES) pressure and serum gastrin concentration were compared in 15 male patients with symptoms of gastroesophageal reflux. The LES pressure was measured by a rapid pull-through technique in patients after an overnight fast. The mean basal LES pressure on the four study days ranged from 5.4 to 5.6 mm Hg. Each drug produced a significant increase in pressure compared with the placebo. Metoclopramide at 20 mg produced a significantly higher pressure from 30-60 min after ingestion than either the 10 mg dosage of metoclopramide or bethanecol. LES pressures after 10 mg metoclopramide or bethanecol were not significantly different. The peak of LES pressures for the 15 subjects ranged from 4.3-15.0 mm Hg for placebo (mean, 9.2); 3.0-19.3 mm Hg for 10 mg metoclopramide (mean, 11.9); 8.4-23.5 mm Hg for 20 mg metoclopramide (mean, 15.8); and 4.5-19.5 mm Hg for bethanecol (mean, 11.7). The peak change in LES pressure from basal and the peak LES pressure were each significantly correlated with the basal LES pressure after 20 mg metoclopramide. Only the peak LES pressure was significantly correlated with basal pressure after 10 mg metoclopramide. There was no correlation between these two parameters and the basal LES pressure after bethanecol. Mean serum gastrin concentrations were not altered by any drug. Bethanecol produced statistically significant but small decreases in diastolic blood pressure and in pulse rate after 40 min. These data confirm previous findings of a correlation between basal LES pressure and rise in pressure after metoclopramide. It is suggested that metoclopramide be considered in a clinical trial in the treatment of gastroesophageal reflux.

7077 CONSERVATIVE SURGICAL TREATMENT OF REFLUX ESOPHAGITIS AND ESOPHAGEAL STRICTURE.

(E.) Herrington, Jr., J. L.; Wright, R. S.; Edwards, W. H.; Sawyers, J. L. (Vanderbilt Univ. Medical Cent., Nashville, Tenn.). *Ann. Surg.* 181(5):552-566, 1975.

Operative dilatation accompanied by an antireflux precedure was used in the treatment of 17 consecutive patients with advanced esophageal stricture and reflux esophagitis during a 3-yr period. The patients included nine men and eight women, aged 46-90 yr. Symptoms of reflux esophagus were present from 18 months to 30 yr. Preoperative procedures included barium examination of the esophagus and upper gastrointestinal tract, cinefluoroscopy, and esophagoscopy with biopsy. The stricture was of the longitudinal type in 10 patients and a short, distal, and annular stricture was found in the remaining seven cases. Simultaneous ante- and retrograde dilatation was carried out at operation in all cases. A Nissen fundoplication was performed in 15 patients, one had a Hill posterior gastropexy, and the remaining patient had a Belsey repair. Of the 17 patients, 16 survived surgery, and were studied postoperatively. Of these 16, one died soon after surgery of cardiovascular complications. Excellent clinical results were obtained in 11 cases, with no abdominal discomfort and no dietary restrictions. Mild and intermittent abdominal discomfort was experienced in four patients. During the postoperative follow-up, six patients required from one to three esophageal dilatations during the early postoperative period, and two patients with severe longitudinal strictures required monthly dilatations up to one yr. It is suggested that this simplified surgical approach directed toward correction of reflux and preservation of organ tissue should be attempted before more radical surgery.

7078 EFFECT OF FUNDOPLICATION ON THE LOWER ESOPHAGEAL SPHINCTER.

(E.) Bowes, K. L.; Sarna, S. K. (Dept. Surgery, Univ. Alberta, Edmonton, Alberta T6G 263, Canada). *Can. J. Surg.* 18(4):328-334, 1975.

Manometric measurements were made of the lower esophageal sphincter (LES) before and after fundoplication, to determine whether the alleviation of symptoms after this procedure can be attributed to either the creation of or improved function of a physiologic sphincter. A modified Nissen fundoplication was performed in 26 patients with heartburn and regurgitation; 20 of these had hiatus hernia. Manometry was performed before and 3 months after surgery; cadaver studies were also made. Complete recovery was noted in 24 patients. Symptoms reoccurred in one patient after 3 months, and in another, after 26 months. The common cavity test (simultaneous increases in gastric and esophageal size during abdominal compression) was positive in 22 patients before surgery, and in only the two with recurring symptoms postoperation. The acid perfusion test was positive in 25 patients before fundoplication (mean time, 267 sec). The time required for reproduction of these results was increased in all 26 after surgery, and in seven, results were negative (mean time, 616 sec; $P < 0.01$). Resting LES pressure increased from a mean of 12.6 presurgery to a mean of 16.5 cm H_2O postsurgery. An increase in LES pressure was seen in 15 patients, there was no change in four, and in seven, the pressure fell. It is suggested that increases in sphincter pressure after fundoplication are secondary to extrinsic narrowing, and do not indicate creation of a physiologic sphincter.

7079 MEDICAL AND SURGICAL MANAGEMENT OF REFLUX ESOPHAGITIS: A 38-MONTH REPORT ON A PROSPECTIVE CLINICAL TRIAL.

(E.) Behar, J.; Sheahan, D. G.; Biancani, P.; Spiro, H. M.; Storer, E. H. (Veterans Admin. Hosp., West Haven, Conn., 06516). *N. Engl. J. Med.* 293(6):263-268, 1975.

A controlled prospective and randomized study was performed to compare posterior gastropexy with anterior fundoplication, and to determine factors influencing selection of patients for medical or surgical treatment. The patients studied included 51 men with symptoms of chronic reflux and objective evidence of reflux esophagitis for 2 yr or more. Of these, 31 were randomized into groups of surgical (15) and medical patients (16); the remaining 20 were non-randomized patients receiving medical treatment. Surgical treatment consisted of a Belsey Mark IV alone in ten men, and this combined with the Hill method in five. Medical treatment consisted of head elevation (15 cm), bland diet, weight reduction and liquid antacids. All patients were followed for 20 to 46 mo. After operation, 11 of 15 patients had no symptoms of reflux, with a negative acid infusion test, except for one patient on one occasion. The esophagus appeared normal at endoscopy. Only three patients in the randomized medical group and four in the non-randomized group became asymptomatic with a negative acid infusion test and normal esophagus at esophagoscopy. The correlation of symptomatic and objective responses to both surgical and medical management was good. Patients with excellent to good response to surgical treatment had an increase in resting sphincter pressures persisting for up to 3 yr ($P < 0.001$). The response to medical management correlated well with the severity of the esophagitis and the degree of sphincter incompetence. These results indicate that at least during the first 3 yr, surgical treatment is more effective than current medical management in patients with severe reflux symptoms.

7080 HISTOLOGIC ABNORMALITIES IN REFLUX ESOPHAGITIS.

(E.) Behar, J.; Sheahan, D. C. (VA Hosp., West Haven, Conn.). *Arch. Pathol.* 99(7): 387-391, 1975.

Esophageal mucosal response to gastroesophageal reflux was studied in patients with heartburn with normal endoscopic appearance of the esophageal mucosa. Histological findings were compared in 15 control patients without gastroesophageal symptoms and 40 consecutive male patients with heartburn (postprandial, substernal burning pain, or postural changes), with or without regurgitation or dysphagia, for at least two yr prior to admission. All subjects had upper gastrointestinal roentgenograms, esophagoscopy, acid perfusion tests, esophageal manometry, intraesophageal pH study, maximal histamine test, and multiple esophageal biopsies. Heartburn was the most prominent symptom in 20 patients with mild esophagitis, and four of these also had regurgitation. The radiologic appearance of the esophagus was normal in these patients. The mean lower esophageal sphincter pressure was significantly lower than that of the controls. Patients with severe esophagitis had heartburn (95%), regurgitation (65%), dysphagia (40%), and low-grade bleeding (25%): all showed either mucosal friability or acute or chronic ulcerated lesions. Histologic examinations showed lymphoid aggregates in 50% of controls, and in 85% and 65%, resp., of patients with severe and mild esophagitis. Neutrophils were observed in 5% and 40%, resp., but were absent in control samples. Patients with mild and severe esophagitis had papilla higher than 50% of the mucosal thickness in 95% and 100%, resp., and a basal zone more than 15% of mucosal thickness in 95% and 94%, resp. Both abnormalities were seen in patients with mild and severe esophagitis in at least two biopsy specimens in 95% and 94%, resp. Of the controls, 47% had elongated papillae and 13% had a hyperplastic basal zone; none had both abnormalities together. These results confirm the validity of the use of the simultaneous presence of elongated papilla in the lamina propria and basal cell hyperplasia of the squamous epithelium in at least two biopsy specimens as diagnostic criteria of reflux esophagitis.

7081 ACHALASIA AND ESOPHAGEAL CARCINOMA. STUDIES IN EARLY DIAGNOSIS FOR IMPROVED SURGICAL MANAGEMENT.

(E.) Carter, R.; Brewer, L. A., III. (Dept. Surgery, Univ. California, Irvine, Calif.) *Am. J. Surg.* 130(2):114-120, 1975.

Four patients with achalasia and carcinoma were studied, and 221 cases of this association were reviewed in the literature to determine salient features of early diagnosis. The average age at the appearance of esophageal carcinoma in achalasia patients was 48 yr, in contrast to 64 yr for esophageal cancer in general. The average duration of the achalasia was 17 yr. Men were affected three times as often as women; this is a reversal of the frequent prevalence of achalasia in women. The most common site of origin was the middle third of the esophagus. The earliest signs were unexplained gastrointestinal bleeding or anemia. Other presenting symptoms were: recurrence of dysphagia, blood-tinged regurgitation, retrosternal or back pain, excessive weight loss, development of clubbing, and unexplained general deterioration. The lesions were often bulky, polypoid and largely epidermoid; they were easily missed on esophagography and esophagoscopy due to retention of food, and were rarely resectable, resulting in poor prognosis. There were indications that stasis esophagitis is premalignant. Early myotomy to relieve obstruction may be preventative, but once megaesophagus has developed, obstruction is usually permanent. Thorough cleansing of the esophagus prior to esophagography and esophagoscopy is emphasized, and esophageal washings, endoscopic cytologic study and biopsy are recommended as highly accurate diagnostic procedures. It is concluded that diagnosis must be early if curative resection is to be possible.

7082 PROBABLE PATHOGENIC RELATION BETWEEN SYSTEMIC MASTOCYTOSIS AND REFLUX ESOPHAGITIS.

(Sp.) Garrido, M.; Calvo Cano, M.; Villegas, A.; Gonzalez, G. (Clinical Hosp., Faculty Medicine, Madrid, Spain). *Rev. Clin. Esp.* 135(1):73-78, 1974.

7083 THERAPY IN BLEEDING FROM HIATUS HERNIA. *(Ger.)* Hiemeyer, V. (no affiliation given). *Thromb. Diath. Haemorrh.* (Suppl. 61):111-116, 1975.

7084 PATHOLOGICAL AND ANATOMICAL CONSIDERATIONS OF ESOPHAGEAL BLEEDING ESPECIALLY IN REGARD TO VARICES. *(Ger.)* Gusek, W. (no affiliation given). *Thromb. Diath. Haemorrh.* (Suppl. 61):11-23, 1975.

7085 THE PATHOLOGY OF THE HIATUS HERNIA AS A SOURCE OF GASTROINTESTINAL BLEEDING. *(Ger.)* Mitschke, H. (no affiliation given). *Thromb. Diath. Haemorrh.* (Suppl. 61):91-102, 1975.

7086 HEMOSTATIC CONDITIONS AND ESOPHAGEAL VARICES IN VINYLCHLORIDE-RELATED DISEASE. *(Ger.)* Bachner, U.; Etzel, F.; Lange, C. E.; Marsteller, H. J.; Veltmann, G. (no affiliation given). *Thromb. Diath. Haemorrh.* (Suppl. 61):67-73, 1975.

7087 PATHOGENESIS AND FREQUENCY OF BLEEDING FROM HIATUS HERNIA. *(Ger.)* Tilsner, V. (no affiliation given). *Thromb. Diath. Haemorrh.* (Suppl. 61):107-110, 1975.

7088 BENIGN TUMOURS OF THE ESOPHAGUS. *(Fr.)* Forster, E.; Cinqualbre, J.; Tongio, J.; Olive, B.; Weill-Bousson (Clinique chirurgicale A, C.H.U., Hopital civil, 67000 Strasbourg, France). *Rev. Practicien* 24(27):2447-2468, 1974.

7089 ESOPHAGEAL CARCINOMA. *(Por.)* Junior, A.; Braga, A.; Cardoso, V. (Faculty Medicine, Univ. Porto Servico, Brazil). *J. Med. (Lisboa)* 87(1644):237-246, 1975.

7090 LEIOMYOSARCOMA OF THE ESOPHAGUS. *(Ger.)* Schafer, V. W. (Mannheim Faculty Clinic Medicine, Univ. Heidelberg, Heidelberg, Germany). *Fortschr. Gerb. Roentgenstr. Nuklearmed.* 122(2):169-170, 1975.

7091 FOLLOW-UP OF ESOPHAGEAL CANCERS TREATED AT THE FRANCOIS BACLESSE CENTER SINCE 1964. *(Fr.)* Roussel, A. (Centre Francois Baclesse, Caen, France). *Ouest Medical* 28(6):381-386, 1975.

7092 CLINICAL, ENDOSCOPIC AND MORPHOLOGIC STUDIES IN FOUR PATIENTS WITH COLUMNAR EPITHELIUM LINING THE DISTAL TWO-THIRDS OF THE ESOPHAGUS. *(E.)* Gibb, S. P.; Mallari, R.; Haggitt, R.; Ellis, F. H. (Lahey Clin. Found., Boston, Mass.). *Gastroenterology* 68(4):1029, 1975.

7093 GASTRIC RUGAL HYPERTROPHY IN HIATAL HERNIA SAC (SENTINEL FOLD), A POSSIBLE ENDOSCOPIC SIGN OF GASTROESOPHAGEAL REFLUX. *(E.)* Butler, M. L.; Walta, D. C.; Johnson, L. F. (Tripler Army Med. Cen., Honolulu, Hawaii). *Gastroenterology* 68(4):1022, 1975.

7094 ACUTE ESOPHAGEAL DAMAGE FROM ONE BRAND OF TETRACYCLINE TABLETS. *(E.)* Burke, E. L. (St. Paul-Ramsey Hosp., St. Paul, Minn.). *Gastroenterology* 68(4):1022, 1975.

7095 ACHALASIA: A RETROSPECTIVE CORRELATION. *(E.)* Biederman, M. A.; Rinaldo, J. A.; Gelzayd, E. (Providence Hosp., Southfield, Mich.). *Gastroenterology* 68(4):1019, 1975.

7096 ESOPHAGEAL CARCINOMA ARISING ON BARRETT'S EPITHELIUM. *(E.)* Alves, M. A.; Ellis, F. H.; Haggitt, R.; Colcher, H. (Lahey Clin. Found., Boston, Mass.). *Gastroenterology* 68(4):1017, 1975.

7097 A HISTOPATHOLOGIC DEMONSTRATION OF THE ASSOCIATION OF GASTRITIS AND REFLUX ESOPHAGITIS. *(E.)* Volpicelli, N. A.; Yardley, J. H.; Hendrix, T. R. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Gastroenterology* 68(4):1007, 1975.

7098 ABSENCE OF ACID SENSITIVITY IN PATIENTS WITH BENIGN PEPTIC ESOPHAGEAL STRICTURES. *(E.)* Volpicelli, N. A.; Bedine, M. S.; Hendrix, T. R. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Gastroenterology* 68(4):1007, 1975.

7099 ALKALINE SENSITIVE REFLUX ESOPHAGITIS. *(E.)* Vela, A. R.; Akdamar, K. (Louisiana State Univ. Sch. Med., New Orleans, La.). *Gastroenterology* 68(4):1005, 1975.

7100 OBSTRUCTIVE JAUNDICE SECONDARY TO PARA-ESOPHAGEAL HERNIATION. *(E.)* Sicular, A.; Klion, F. M.; Werther, J. L. (Mt. Sinai Sch. Med., New York, N.Y.). *Gastroenterology* 68(4):987, 1975.

7101 "INFORMED CONSENT" FOR ESOPHAGO-GASTROSCOPY: AN APPRAISAL OF PATIENTS' REACTIONS. *(E.)* Roling, G. T.; Pressgrove, L. W.; Keeffe, E. B.; Raffin, S. B. (Naval Regional Med. Cent., Oakland, Calif.). *Gastroenterology* 68(4):975, 1975.

7102 HYPERCALCEMIA (HYCA) IN SQUAMOUS CELL CARCINOMA OF THE ESOPHAGUS (SEC). *(E.)* Ravry, M. J. R. (Univ. Puerto Rico Sch. Med., San Juan, Puerto Rico). *Gastroenterology* 68(4):971, 1975.

7103 ESOPHAGEAL MOTOR ABNORMALITY DURING HICCUP. *(E.)* Mukhopadhyay, A. K.; Graham, D. Y. (Baylor Coll. Med., Houston, Texas). *Gastroenterology* 68(4):962, 1975.

7104 FAILURE OF GASTRIN ANTISERUM TO INFLUENCE LOWER ESOPHAGEAL SPHINCTER PRESSURE: A DOUBLE BLIND CONTROLLED STUDY. *(E.)* Goyal, R. K.; McGuigan, J. E. (Univ. Texas Southwestern Med. Sch., Dallas, Tex.). *Gastroenterology* 68(4):951, 1975.

7105 EFFECT OF ORAL 16,16 DIMETHYL PROSTAGLANDIN E_2 (PGE_2) ON THE LOWER ESOPHAGEAL SPHINCTER IN MAN. *(E.)* McCallum, R. W.; Ippoliti, A. F.; Sturdevant, R. A. L. (Wadsworth VA Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):949, 1975.

7106 STUDIES ON THE MECHANISM OF THE LOWER ESOPHAGEAL SPHINCTER PRESSURE RESPONSE TO ALKALI INGESTION IN MAN. *(E.)* McCallum, R. W.; Kline, M. M.; Sturdevant, R. A. L. (Wadsworth VA Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):948, 1975.

7107 BARRETT'S ESOPHAGUS—DIAGNOSIS BY TECHNITIUM SCAN. *(E.)* Mangla, J. C.; Brown, M. (Monroe Community Hosp., Rochester, N.Y.). *Gastroenterology* 68(4):943, 1975.

7108 BARRETT'S ESOPHAGUS--CLINICAL AND PHYSIOLOGICAL CHARACTERISTICS. *(E.)* Mangla, J. C.; Desbaillets, L. G.; Schenk, E.; Guarasci, G.; Turner, M. D.; Kubasik, N. P. (Monroe Community Hosp., Rochester, N.Y.). *Gastroenterology* 68(4): 942, 1975.

7109 GASTRO-ESOPHAGEAL REFLUX: HISTOLOGICAL AND MORPHOMETRIC FINDINGS. *(E.)* Krejs, G. J.; Seefeld, U.; Siebenmann, R. E.; Haemmerli, U. P.; Blum, A. L. (Stadtspital Triemli, Zurich, Switzerland). *Gastroenterology* 68(4):931, 1975.

7110 THE ROLE OF ENDOSCOPIC THERAPY IN SURGERY FOR ESOPHAGEAL ATRESIA. *(It.)* Cetrullo, C.; Nofrini, U. (Inst. Anestheziol. Reanim., Univ. Bologna, Bologna, Italy). *Clin. Pediatr.* 56(12): 571-576, 1974.

7111 HIATAL HERNIA: SURGICAL THERAPY USING OUR METHOD. *(Ser.)* Kucisec, A.; Orlic, R.; Kucic, S.; Brinar, P.; Stimac, I. (Military Hosp., Zagreb, Yugoslavia). *Vojnosanit. Pregl.* 32(2):124-127, 1975.

7112 THE INCIDENCE OF ESOPHAGITIS ASSOCIATED WITH OTHER GASTROINTESTINAL DISEASES. *(Ger.)* Arendt, R.; Hauzeur, F. (Bereich Medizin, Universitat Rostock, DDR-25 Rostock, Ernst-Heydemann-Strasse, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(5/6):251-257, 1974.

7113 LONG-TERM CLINICAL RESULTS IN PATIENTS OPERATED ON FOR HIATAL HERNIA. *(It.)* Nenov, G.; Panzieri, E.; Colombi, P.; Cozzi, G. (Ospedale Maggiore Ca Granda, Milan-Niguarda, Italy). *Arch. Ital. Chir.* 98(4):479-482, 1974.

7114 SAINT'S TRIAD: IS IT A PATHOLOGICAL ENTITY? (17 CASES). *(Fr.)* Bertrand, J.; Le Goarant, P. (No affiliation given). *Rev. Fr. Gastroenterol.* (108):15-16, 19-20, 22, 1975.

7115 STUDYING HIATAL HERNIAS WITH AMPLIFIED FLUOROSCOPY. *(Fr.)* Ecarlat, B.; Dartigues, P. (Faculte Medecine Tours, C.H.R. Bretonneau, 2, bd Tonnelle, 37000 Tours, France). *Rev. Fr. Gastroenterol.* (107):25-28, 31-32, 35-39, 1975.

7116 THERAPEUTIC CONSIDERATIONS FOR ULCERS IN THE NECK OF HIATAL HERNIAS: 11 CASES. *(Fr.)* Bouali, B. (C.H.U., 49000 Angers, France). *Sem. Hop. Ther.* 50(9):611-612, 1974.

7117 BENIGN DISEASES OF THE ESOPHAGUS. *(Ger.)* Pichlmaier, H.; Junginger, T. (Chirurgische Klinik, Universitat Munchen, Munchen, Germany). *Zentralbl. Chir.* 100(5):257-265, 1975.

7118 ESOPHAGEAL STENOSIS SECONDARY TO SCLERODERMA: REPORT OF ONE CASE TREATED SURGICALLY. *(Sp.)* Moncada Moneu, A.; Martinez Calzon, J. L.; Rodriguez Quintillan, C.; Munoz de la Guardia, J. L.; Maldonado Eloy-Garcia, J.; Fernandez de Rota, A.; Garcia Alarcon, R.; Algarra Garcia, J.; del Valle Moyano, D. (Residencia "Carlos Haya", Malaga, Spain). *Rev. Clin. Esp.* 136(3):265-271, 1975.

7119 PEPTIC STENOSIS OF THE ESOPHAGUS. *(Fr.)* Gaillard, J.; Haguenauer, J. P.; Dumolard, P.; Maitrejean, Y. (Red Cross Hosp., Lyon, France). *J. Fr. Otorhinolaryngol.* 24(1):43-48, 1975.

7120 GENERAL SEMIOLOGY AND EXPLORATION OF THE OESOPHAGUS. *(Fr.)* Mouchet, A.; Guivarc'h, M. (Dept. General Gastrointestinal Surgery, C. M. C. Foch, Suresnes, France). *Rev. Prat.* 24(27):2382-2404, 1974.

7121 CANCER OF THE OESOPHAGUS. TREATMENT. *(Fr.)* Fekete, F.; Froissard, P. (Clinical Surgery, Beaujon Hosp., Clichy, France). *Rev. Prat.* 24(27):2423-2446, 1974.

7122 RARE DISEASES OF THE ESOPHAGUS. *(Fr.)* Hay, J. M.; Fekete, F.; Lortat-Jacob, J. L. (Louis-Mourier Hosp., 92700 Colombes, France). *Rev. Prat.* 24(27):2527-2543, 1974.

7123 OESOPHAGUS ULCERS. *(Fr.)* Maillard, J. N.; Flamant, Y. (Faculty Medicine, Dijon, France). *Rev. Prat.* 24(27):2491-2512, 1974.

7124 ESOPHAGEAL ACHALASIA ASSOCIATED WITH GASTRIC CARCINOMA: LACK OF EVIDENCE FOR WIDESPREAD PLEXUS DESTRUCTION. *(E.)* Shulze, K. S.; Goresky, C. A.; Jabbari, M.; Lough, J. O. (Montreal General Hosp., Quebec, Canada). *Can. Med. Assoc. J.* 112(7):857-863, 1975.

ESOPHAGUS

7125 CLINICAL STAGING SYSTEM FOR CARCINOMA OF THE ESOPHAGUS. *(E.)* Anonymous (Amer. Joint Committee for Cancer Staging and End Results Reporting, 55 E. Erie St., Chicago, Ill. 60611). *Cancer J. Clin.* 25(2):50-57, 1975.

7126 SURGERY FOR HIATUS HERNIA IN ADULTS. *(Fr.)* Hollender, L. F.; Meyer, C.; Alexiou, D.; Gaussin, G. (Dept. General Surgery, Univ. Hospital Center, Strasbourg, France). *Lyon Chir.* 71(2):109-113, 1975.

7127 ESOPHAGEAL PAPILLOMATOSIS AND ACANTHOSIS NIGRICANS. *(Fr.)* Heully, F.; Gaucher, P.; Weber, M.; Jeanpierre, R.; Laurent, J.; Kremer, B.; Beurey, J. (Brabois Hosp., Vandoeuvre, France). *Ann. Gastroenterol. Hepatol.* 10(6):487-490, 1974.

7128 GASTRO-OESOPHAGEAL ACID REFLUX. METHOD FOR 12-HOUR CONTINUOUS RECORDING OF OESOPHAGEAL pH WITH ANALYSIS OF RECORDS. *(E.)* Beosby, S.; Madsen, T.; Sorensen, H. R. (Dept. Thoracic and Cardiovascular Surgery, Odense Sygehus, Odense, Denmark). *Scand. J. Gastroenterol.* 10(4):379-384, 1975.

7129 INFANTILE ACHALASIA. INHERITED AS AN AUTOSOMAL RECESSIVE DISORDER. *(E.)* Westley, C. R.; Goldman, S.; Wiser, W. C. (Public Health Service Indian Medical Center, 4212 N. Sixteenth St., Phoenix, Ariz. 85016). *J. Pediatr.* 87(2):243-246, 1975.

7130 ABNORMAL DUODENAL LOOP IN PATIENTS WITH SLIDING ESOPHAGEAL HIATAL HERNIA—STUDIES ON INTRAGASTRIC PRESSURE AND GASTROCOLIC REFLEX. *(E.)* Thommesen, P. (Central Hosp., Randers, Denmark). *Fortschr. Rontgenstr.* 121(6):749-760, 1974.

7131 PHARMACOLOGY OF THE ESOPHAGEAL MOTOR FUNCTION. *(E.)* Christensen, J. (Univ. Iowa Hosp. and Clinics, Iowa City, Iowa, 52242). *Annu. Rev. Pharmacol.* 15:243-258, 1975.

7132 DIFFUSE LEIOMYOMATOSIS OF THE ESOPHAGUS. A CASE REPORT AND REVIEW OF THE LITERATURE. *(E.)* Fernandes, J. P.; Mascarenhas, M. J.; da Costa, J. C.; Correia, J. P. (Santa Maria Hosp., Lisbon 4, Portugal). *Am. J. Dig. Dis.* 20(7):684-690, 1975.

7133 CARCINOMA OF THE OESOPHAGUS: PREOPERATIVE IRRADIATION FOLLOWED BY PLANNED RESECTION FOR LESIONS IN THE MIDDLE AND LOWER THIRDS—AN INTERIM REPORT. *(E.)* Smith, F. S.; Gibson, P.; Nicholls, T. T. (Royal Perth Hosp., Box X2213, Perth, Western Australia 6001). *Aust. N.Z. J. Surg.* 45(2):176-178, 1975.

See also, 6700, 6721, 6985, 6987, 7004, 7008, 7022, 7048, 7203, 7208, 7741, 7860, 7871, 7876, 7910.

STOMACH

7134 GASTRIC POLYPECTOMY. *(E.)* Seifert, E.; Elster, K. (Medizinische Hochschule, Hannover, Germany). *Am. J. Gastroenterol.* 63(6):451-456, 1975.

The histological findings of direct biopsy were compared with those of total excision in 75 gastric polyps removed by electroresection through a fiberscope, and a new histological classification of gastric polyps was developed based on 244 gastric polyps in 161 patients. The polyps were recovered *in toto* by suction or special grasper forceps. In 53 of 75 cases, discrepancies of histologic diagnosis were observed. The most frequent cause of discrepancy was the mixed form of epithelial polyp. Superficial excision very often yielded a pattern of foveolar hyperplasia, suggesting the biopsy was taken from a hyperplastic polyp. The hyperplastic gastric polyp, occurring in 14.8% of the patients with a single polyp, corresponded to the hyperplastic colonic polyp in structure and pathogenesis. Its histological criterion was the presence of finger-like, elongated crests and correspondingly deep stretched pits, resulting in a somewhat papillary structure. The adenomatous gastric polyp, occurring in 47.7% of patients with solitary gastric polyps, revealed structural peculiarities which exclude a pathogenetic relation with the adenomatous colonic polyp. This polyp apparently has an intermediate position between hyperplasia and adenoma. The real adenomatous polyp, a true adenoma, was very rare and occurred in only 7.4% of the cases with solitary polyps. Six patients had generalized gastric polyposis. In 92 sites of resections, out of a total of 176 sites, healing was complete at the end of one wk. The following classification of gastric polyps is suggested: focal hyperplasia, hyperplasiogenic polyp, adenoma, proliferation of glandula neck with epithelial atypia, and early gastric cancer types I and IIA. The findings suggest that gastric polyps are generally not precancerous lesions though cancer does occur in rare cases. Neoplasia does not appear to be related to number of polyps, to site, but rather presumably to inherent biologic activity.

7135 FIBEROPTIC ENDOSCOPY IN TREATMENT OF CORROSI INJURY OF THE STOMACH. *(E.)* Chung, R. S. K.; DenBesten, L. (Veterans Administration Hosp., Iowa City, Iowa 52240). *Arch. Surg.* 110(6):725-728, 1975.

Three patients with corrosive injury of the esophagus and/or stomach were studied by multiple endoscopies to document the natural history of corrosive injury. A 47-yr-old alcoholic who drank 355 ml of 23% HCl developed intense abdominal pain and vomited dark red mucoid material. Physical examination revealed erythema of the palate and posterior pharynx with tenderness of the epigastrium. Endoscopy showed hemorrhagic erosion of the esophagus. The patient was treated with nasogastric suction, i.v. fluids and antibiotics and steroids. Endoscopy on the sixth day revealed a 3 cm length of mild esophageal erythema and gangrenous changes in the gastric antral mucosa. The patient was operated, and full-thickness necrosis was observed on the serosa, which extended to the transverse mesocolon. Gastric antrectomy with Billroth I reconstruction was followed by uneventful recovery. A 45-yr-old male who drank 59 ml of 30% NaOH vomited red blood and had melena 4 days after ingestion. Endoscopy on the fifth day revealed extensive hemorrhagic areas in the stomach, most marked in the antrum. He was treated similarly to the first patient. Two weeks post-injury, repeat endoscopy showed the antrum to be scarred and edematous. The patient was treated surgically and recovered. A 45-yr-old male ingested 10 g of mercury bichloride and 75 mg of valium. Presenting symptoms were as above. Two weeks post-injury, endoscopy revealed erosions of the gastric mucosa most severe in the antrum. Forty days post-injury, the mucosa had improved and granulations were noted. The patient made an uneventful recovery. The acute stage involves hemorrhagic erosions and ulcerations of the mucosa, which gradually heal and fibrosis with decreased vascularity results, while gangrenous mucosa suggests full-thickness necrosis.

7136 MEASUREMENT OF IMMUNOREACTIVE GASTRIN IN GASTRIC MUCOSA. *(E.)* Malmstrom, J.; Stadil, F. (Rigshospitalet, Copenhagen, Denmark). *Scand. J. Gastroenterol.* 10(4):433-439, 1975.

A method for measuring gastrin in gastric mucosa was developed, and the distribution of gastrin in the stomach of pig, dog, cat, rabbit, and man was examined. Biopsy specimens were frozen, boiled, and homogenized. The gastrin content was measured by radioimmunoassay. Monoiodinated 125-I-SHG (synthetic human gastrin) was used as tracer. Gastrin was found in measurable amounts in all specimens examined, but the content was considerably higher inside the antrum. The highest concentration was found in man. In corpus biopsies from 21 subjects, the gastrin content was 78 ng/g mucosa. The border between the corpus and the gastrin rich antrum was sharp, but apart from this no particular pattern of gastrin distribution was apparent in the two parts of the stomach. Duodenal ulcer patients, control patients, and normal subjects had high gastrin content in the stomach, whereas patients with gastric carcinoma and gastric ulcers had low. In 44 patients with duodenal ulcer, the antral gastric concentration was 21.3 μg Eq/g mucosa; in 15 patients with prepyloric ulcer, 23.0; in 10 patients with gastric ulcer, 5.9; and in 16 patients with gastric carcinoma, 7.9. The control group consisted of 10 healthy volunteers and 12 patients with minor abdominal complaints. Mean antral gastrin concentrations were 28.1 and 20.7, resp. Human mucosa contained 8-10 times more gastrin than in dogs and 4-8 times more than in pigs. The results agree with previous studies that antral gastrin content in duodenal ulcer patients and normal subjects does not differ and clearly indicates that gastrin content is not increased in duodenal ulcer.

7137 INTRAMURAL INJECTION OF ETHANOL UNDER DIRECT VISION FOR THE TREATMENT OF PROTUBERANT LESIONS OF THE STOMACH. *(E.)* Otani, T.; Tatsuka, T.; Kanamaru, K.; Okuda, S. (Center Adult Diseases, 3-3, Nakamichi 1-chome, Higashinari-ku, Osaka 537, Japan). *Gastroenterology* 69(1):123-129, 1975.

Local injection of ethanol was used to remove gastric polyps and wide-based polypoid growths in dogs. This method was also used in the treatment of early gastric cancer in poor-risk patients. Ulcers were produced in mongrel dogs by bleomycin, mitomycin, OK-432, acetic acid and ethanol by intramural injection of various concentrations. Ethanol in a concentration of 95% was the most effective, producing immediate changes in the gastric mucosa which delineated the size of the ulcer. The depth of ulceration could be controlled and the ulcer healed readily. Gastroscopic injection with 95% ethanol was used to treat 54 patients with pedunculated (21 patients), narrow-based sessile (eight) and wide-based sessile polypoid lesions (25). Of 54 cases, 35 were hyperplastic or adenomatous polyps, 17 showed atypical hyperplasia and two had early gastric cancer, type II a. Complete eradication was confirmed by biopsy in all patients with atypical hyperplasia and early gastric cancer. Of 54 cases, treatment was not successful in three: one with wide-based sessile growth and two with pedunculated polyps. Complete healing with scar formation was seen in 43 cases within 6 weeks. It is concluded that polyp removal by intramural injection of ethanol is appropriate for the management of early gastric cancer in low-risk patients.

7138 INTRAMURAL VASCULAR CHANGES IN STOMACHS REMOVED BECAUSE OF BLEEDING—AS VISUALIZED WITH INDIAN INK—. *(E.)* Nagao, F.; Ikeuchi, J.; Kjijma, M.; Narikawa, T. (Jikei Univ. Sch. Medicine, Japan). *Jikeikai Med. J.* 21(3-4):249-258, 1975.

Gastric intramural vascular changes in stomach during or shortly after bleeding were determined under a microscope in 41 surgical specimens after visualizing the vessels with indian ink. A relation between the patient's circulatory disturbance due to hemorrhage and the features of the gastric vascular damage was sought. The degree of circulatory disturbance due to gastric bleeding was graded as mild (Group I), moderate (Group II), or serious (Group III) according to the response of the patient to a test transfusion given rapidly in a volume up to 1000 ml. The main pathological features observed in the bleeding groups were such changes as rupture of the large or capillary blood vessels at an ulcer crater; rupture, dilatation or tortuosity of the mucosal capillary vessels; and rupture or tortuosity of the submucosal vessels. The presence of the pathological changes was most marked in Group III (6 patients), and rupture of the large blood vessels was only seen in this group. Two specimens in Group III had no arterial rupture but showed a high degree rupture of the mucosal and ulcer's capillary, which may explain their serious bleeding. The outstanding feature of Group II (14 patients) was a high incidence of marked rupture of the mucosal capillary, which should explain bleeding in this group. Mild bleeding of Group I (21 patients) may be explained by the fact that this group had no bleeding from an ulcer and that rupture of the mucosal capillary was not severe. It is concluded that the rate of gastric bleeding and the vascular status of bleeding lesions can be correlated to some extent.

7139 GASTROSCOPIC OBSERVATIONS RELATED TO BIOPTICAL HISTOLOGY IN HEALTHY MEDICAL STUDENTS.

(E.) Myren, J.; Serck-Hanssen, A. (Ulleval Hosp., Oslo 1, Norway). *Scand. J. Gastroenterol.* 10(4):353-355, 1975.

Gastric mucosal samples from ten healthy volunteers were studied by gastroscopy with histology in directed biopsy specimens. Gastroscopy was performed after an overnight fast and an i.v. injection of 1 ml of pethidin with 0.3 mg of atropine. Degrees of mucosal alterations were categorized as: no alteration (0), slight changes (1), moderate (2), and pronounced reddening and mucus covering (3). A normal mucosal folding was recorded as 2, decreased folding was recorded as 1, and increased folding was recorded as 3. Directed biopsies (three to eight) were taken from the antral mucosa, and from the mucosa of the greater and lesser curvatures. Normal mucosal folding was found in all subjects. None had mucosal reddening or mucus covering of more than slight grades. Gastroscopy showed normal mucosa in four, probably normal in two, and superficial gastritis in four. Histology revealed a normal mucosa in the antrum of six subjects, normal lesser curvature mucosa in seven and normal at the greater curvature in eight. There was a good correlation between gastroscopic observations and bioptical histology on directed biopsies in six subjects.

7140 IS INTESTINAL METAPLASIA OF THE GASTRIC MUCOSA A PRE-MALIGNANT LESION?

(E.) Reynolds, K. W.; Johnson, A. G.; Fox, B. (Charing Cross Hosp., London, England). *Clin. Oncol.* 1(2):101-109, 1975.

The histological and clinical evidence indicating that intestinal metaplasia of the gastric mucosa is premalignant is reviewed. Histologically, the normal surface columnar epithelium of the gastric mucosa is secretory in function whereas the intestinal surface is both absorptive and secretory. In intestinal metaplasia, there is a morphological and histochemical transformation to a small bowel type of epithelium. It appears that with intestinalization, the gastric mucosal surface epithelium exchanges a secretory for an absorptive function. Clinical evidence indicates that intestinal metaplasia frequently occurs in the same stomach with carcinoma, and that it often occurs closely adjacent to the carcinoma. Furthermore, there is some evidence that metaplasia precedes neoplastic transformation and that the incidence of subsequent carcinoma in patients with intestinal metaplasia is higher than the predicted incidence for the population as a whole. A fairly close connection between endoscopic appearances and histological evidence of intestinal metaplasia has recently been demonstrated; such studies have shown an association between intestinal metaplasia and x-ray negative dyspepsia, as well as between metaplasia and x-ray negative dyspepsia, as well as between metaplasia and gastric ulcer and carcinoma. Although the connection between intestinal metaplasia and carcinoma is not proven beyond doubt, there is sufficient evidence that the former is premalignant to outline a scheme of surgical management: patients showing intestinal metaplasia should be followed-up by regular endoscopy; benign gastric ulcers should in most cases be removed by Billroth I gastrectomy; and duodenal ulcer should be treated by procedures such as highly selective vagotomy rather than polya gastrectomy or gastro-jejunostomy, the former being less likely to produce a gastritis. Antrectomy-en-Roux may prove to be a beneficial prophylactic procedure in patients with severe dyspepsia, bilious vomiting, and well-established intestinal metaplasia.

7141 MICROSCOPICAL CANCER OF THE STOMACH — A STUDY ON HISTOGENESIS OF GASTRIC CARCINOMA.

(E.) Nagayo, T. (Aichi Cancer Center Res. Inst., Nagoya 464, Japan). *Int. J. Cancer* 16(1):52-60, 1975.

To elucidate the histogenesis of gastric cancer preceded by "chronic gastritis," 67 foci (58 cases) of cancer less than 5 mm in diameter were examined histologically. The resected stomachs in all 58 cases were photographed and histological specimens from the main lesion and other parts of the stomach were embedded in paraffin and stained with hematoxylin, eosin, and PAS. Most of the minute cancerous foci were found in the mucosa of the antrum or angulus and were most frequent in the lesser curvature. In all but two cases, these minute foci occurred with peptic ulcer (42 cases) or gastric cancer (14 cases) and were found unexpectedly during the course of routine histological examinations. Minimal erosion was observed in 31 foci, tiny mucosal depressions were seen in ten foci, and no recognizable macroscopic changes were seen in 26 foci. Eighteen foci were located near the main lesion, while 40 were located far from it; seven foci were found in the mucosa adjacent to an ulcer scar. The histological changes in the minute foci were closely correlated with the grade of intestinal metaplasia: well- or moderately well-differentiated adenocarcinomas always occurred in combination with a high degree of intestinal metaplasia; poorly differentiated adenocarcinomas were associated with slight or no metaplasia. Regardless of histological type, the microscopic cancerous changes were always observed in the transitional zone between the foveolar epithelium and pyloric glands. The foci composed of differentiated adenocarcinoma cells were always seen on the deepest layer of the metaplastic mucosa or in the place where the metaplastic foveolar epithelia were situated, and the poorly differentiated adenocarcinomas were primarily found in the middle layer of the nonmetaplastic gastric mucosa. It is concluded that chronic gastritis is the most important and essential change for the development of gastric cancer. Foci in the flat mucosa can be used as a prototype for studying the histogenesis of gastric cancer from this condition.

7142 GASTRIC CANCER SCREENING IN OSAKA. *(E.)*

Aikawa, K. (Center Adult Diseases, 1-3-3 Nakamichi, Higashinari-Ku, Osaka, Japan). *Prevent. Med.* 4(2):154-162, 1975.

An epidemiological, clinical and administrative study of gastric cancer, being carried out in cooperation with the Center for Adult Diseases in Osaka, Japan, is described. The mass-screening program for gastric cancer was originally conducted using mobile units equipped with photofluorographic apparatus in the community and several industrial and business enterprises in a mass-screening program at the Center was later introduced. Gastric cancer was detected in 0.33% of the 78,404 persons examined during the period June 1961-December 1970; approximately 1/3 of these persons had early-stage cancer. The program efficiency of the mobile-unit program was evaluated in a 3-yr study involving 50.5% of the persons aged 40 yr and over living in an agricultural district in the Osaka Prefecture. About 55% of all new cancer cases in this district were detected by mass screening, 77.8% of the gastric cancer cases between 40 and 60 yr of age being detected in this manner. The 5-yr survival rate was significantly higher among those who received mass examination than among those who did not. The program in this district has now been in operation for 10 yr, and the age-adjusted mortality rate from gastric cancer was slightly lower in the second 5-yr period than in the first 5-yr period. In addition, the initial beneficial effects of the mass examination program appeared to last for 2 to 3 yr. At the Center, examinees are screened by a televised X-ray system as well as by gastrocamera and cytologic examination in some cases. The results to date indicate that the Center is more efficient in detecting abnormalities than the mobile units, this being particularly true of early stage gastric cancer. The rates of all gastric diseases except gastric polyps were higher among males than females. It is recommended that a cooperative cancer prevention system be established to meet increasing demands for mass screening in order to decrease the number of cancer deaths.

7143 GASTRIC FUNCTION IN PRIMARY HYPERPARATHYROIDISM IN MAN. *(E.)*

McGeown, M. G.; Connell, A. M. (Belfast City Hosp., Belfast, Northern Ireland). *Irish J. Med. Sci.* 144(6):217-226, 1975.

Gastric function was studied preoperatively in 24 men and 31 women with primary hyperparathyroidism. Six patients had hyperparathyroid bone disease, 44 had renal stones without bone disease, and five had hypercalcemia. All patients were closely questioned for dyspeptic symptoms, evaluated following a barium meal, and given a Kay's augmented histamine test for gastric acid secretion. Tests for antibodies to gastric parietal cells and thyroid were carried out in 20 patients, and serum gastrin in the fasting state was estimated before and after parathyroidectomy in 10 additional patients whose barium meals and pentagastrin tests were normal. Symptoms of dyspepsia were present in 41% of the males and 31% of the females, and active or healed duodenal ulcers were found in 29% of the males and 16% of the females. Six patients had hiatus hernia and one a diverticulum of the duodenum. None of the patients had a gastric ulcer. Kay's augmented histamine test revealed achlorhydria in 11% of the patients and hyperchlorhydria in another 11%, the remaining patients showing normal acid secretion. The acid secretion did not differ significantly from that in a control group of euparathyroid patients without duodenal ulcers. In the hyperparathyroid patients, there was no relation between the basal or posthistamine secretion of acid and the maximum serum calcium concentration. Gastric parietal cell and thyroid antibodies were not detected in any of the patients tested, including five with achlorhydria. Fasting serum gastrin levels were normal in seven and slightly raised in three patients before parathyroidectomy; following surgery, the levels were increased in three of the nine patients tested and unchanged in the others. It is concluded that there is an increased incidence of dyspepsia and duodenal ulcers among patients, particularly male patients, with primary hyperparathyroidism.

7144 IS CHRONIC GASTRITIS A REVERSIBLE PROCESS? FOLLOW-UP STUDY OF GASTRITIS BY STEP-WISE BIOPSY. *(Eng.)*

Rosch, W.; Demling, L.; Elster, K. (Dept. Internal Medicine, Univ. Erlangen-Nurnberg, Erlangen, Germany). *Acta Hepatogastroenterol. (Stuttg).* 22(4):252-255, 1975.

Step-wise biopsies along the minor and greater curves of the gastric mucosa of 36 patients (13 female, 23 male, mean age 49 yr) were performed in 1971 and in 1974 to 1975 in order to gain a representative idea of gastritic changes in the stomach. A comparison of the histological changes revealed identical findings in 15, progression of superficial gastritis in nine, and regression of superficial gastritis in seven. Regression of chronic atrophic gastritis was observed in five patients. In one patient an essentially normal mucosa was found in all biopsy specimens, and in two other patients, parietal cells reappeared without any specific therapy.

7145 STIMULI FOR HEPTADECAPEPTIDE GASTRIN RELEASE: A COMPARISON OF ORAL AND INTRAVENOUS ARGININE-MONOCHLORIDE AND OXO IN NORMAL, VAGOTOMIZED AND ANTRECTOMIZED PATIENTS. *(E.)*

Vinik, A. I.; Kalk, W. J.; Dent, D. M.; Barbezat, G.; Grant, B. J.; Bank, S. (Groote Schuur Hosp., Capetown, South Africa). *Gut* 15(11):97-100, 1975.

The effects of i.v. arginine (10 mg/kg/min for 30 min), p.o. arginine (30 g) and p.o. Oxo (4 cubes) on serum gastrin responses in man were compared in nine normal, six vagotomized, and three antrectomized patients. Basal gastrin concentrations were similar in the control groups for p.o. and i.v. arginine and the Oxo meal, ranging from 26-77 pg/ml. This contrasts with the lower 26.4 ± 3.4 pg/ml in the truncal vagotomized patients and the undetectable levels in antrectomized subjects. I.v. arginine caused a sharp early rise in serum gastrin concentration from a basal of 48.3 ± 2.14 pg/ml to almost three times the basal concentration at 15 min in control subjects. With p.o. arginine there was no rise in serum gastrin concentration. P.o. Oxo feeding caused only a twofold increase in gastrin above the basal concentration. I.v. arginine had no effect in antrectomized and vagotomized subjects. The reason for the absence of gastrin response to p.o. arginine is not apparent, but taken in conjunction with the marked response elicited by the i.v. route, this suggests that arginine is ineffective as a gastrin stimulant by local application to the antrum in man; it may require absorption, with high blood concentration, to act on the gastrin releasing mechanism.

7146 INHIBITORY EFFECT OF L-GLUTAMINE ON GASTRIC IRRITATION AND BACK DIFFUSION OF GASTRIC ACID IN RESPONSE TO ASPIRIN IN THE RAT.

(E.) Okabe, S.; Honda, K.; Takeuchi, K.; Takagi, K. (Faculty Pharmaceutical Sciences, Univ. Tokyo 7-3-1 Hongo, Bunkyo, Tokyo, Japan). *Dig. Dis.* 20(7):626-631, 1975.

The effect of L-glutamine on aspirin-induced gastric lesions at different time intervals was examined. Prevention of back acid diffusion by L-glutamine was also studied in intact and vagotomized rats. Gastric lesions were induced in pylorus-ligated male Donryu rats with 100 mg/kg of aspirin. Aspirin induced gastric lesions at 1 hr after intubation, and lesion formation reached a maximum after 3 hr. L-Glutamine (750 mg/kg) produced a 90% reduction in aspirin-induced gastric lesions. There was a slight but significant increase in gastric secretion by combined aspirin and L-glutamine (319.4 mOsM/kg) at 1 and 3 hr. There was a marked inhibition of H^+ loss by L-glutamine and a corresponding increas in Na^+. Diffusion of H^+ in vagotomized rats into the gastric mucosa and release of Na^+ was not altered by aspirin. L-Glutamine alone or in combination with aspirin inhibited back diffusion of H^+ in vagotomized rats. It is suggested that the inhibition of L-glutamine of aspirin-induced gastric lesions is due to an initial, direct protective effect on the gastric mucosa, and to a subsequent prevention of back acid diffusion.

7147 STATISTICAL EVALUATION OF PREVENTIVE USE OF GLUTATHIONE AGAINST SIDE-EFFECTS OF SURGICAL ADJUVANT CHEMOTHERAPY IN GASTRIC CANCER PATIENTS.

(E.) Itoh, I.; Nakazato, H.; Taguchi, T.; Onoda, T. (Natl. Cancer Cent. Hosp., Tokyo, Japan). *Jpn. J. Clin. Oncol.* 5(1):19-28, 1975.

The ability of glutathione (GSH) to prevent the side-effects manifested during surgical adjuvant mitomycin C chemotherapy was evaluated in 374 cases of gastrectomy for stomach cancer. Of the 374 cases, 174 (controls) were given mitomycin C on and after the day of surgery (total 0.8 mg/kg, i.v.) and twice weekly thereafter (0.08 mg/kg/day, i.v.). The remaining 173 patients were treated similarly, but in addition were given GSH (600 mg/kg/day) i.v. daily for 2 weeks from the day of surgery followed by 600 mg/day p.o. until the last day of mitomycin C administration. The control and GSH groups were similar in terms of 33 background factors, including sex, age, preoperative general condition, and surgical findings. Mitomycin C administration was suspended prior to completion of the total prescribed dose for reasons other than the side-effects in a comparable number of patients from both groups. Discontinuation of mitomycin C treatment due to side-effects was significantly reduced in the GSH group (10.4%) in comparison with the control group (20.3%). In addition, the incidence of abnormally low WBC values (<3000) after the start of mitomycin C treatment was significantly reduced in the GSH group compared with the control group. The two groups did not differ in terms of the incidence of decreased thrombocyte and RBC counts after mitomycin C treatment. The incidence of abnormal SGOT values and the manifestation of positive urine albumin were reduced in the GSH group compared with the control group, but the results are of questionable significance due to the limited number of cases tested. The results indicate that GSH administration is effective in preventing the side-effects and the possible drop in WBC count associated with adjuvant mitomycin C chemotherapy. It may also be of some value in preventing mitomycin C-induced hepatic and renal abnormalities.

7148 EFFECTS IN RATS OF SODIUM CHLORIDE ON EXPERIMENTAL GASTRIC CANCERS INDUCED BY N-METHYL-N'-NITRO-N-NITROSOGUANIDINE OR 4-NITROQUINOLINE-1-OXIDE.

(E.) Tatematsu, M.; Takahashi, M.; Fukushima, S.; Hananouchi, M.; Chirai, T. (Nagoya City Univ., Medical Sch., 1 Kawasumi, Mizuho-cho, Mizuho-ku Nagoya 467, Japan). *J. Natl. Cancer Inst.* 55(1): 101-106, 1975.

The effects of NaCl (6 g/liter in the drinking water on 1 ml/week by intragastric tube) on gastric carcinomas induced by N-methyl-N'-nitro-N-nitrosoguanidine (MNNG, 50 mg/liter in the drinking water) and 4-nitroquinoline-1-oxide (NQO, 1 mg/week by intragastric tube) were studied in adult male Wistar rats. In some cases, the rats were fed a stock diet containing 10% NaCl. The MNNG and NQO treatments were continued for 20 weeks, and the tumor incidence was determined in all animals surviving more than 40 weeks. In the MNNG-treated rats, most of the tumors developed in the glandular stomach, whereas in the NQO-treated animals, almost all tumors developed in the forestomach. No tumors developed in untreated controls or in the animals given only NaCl in the drinking water and/or diet. The forestomach tumors were all of squamous cell origin; the incidence of such tumors in the animals given NQO plus NaCl in the diet and/or by intragastric tube was greater than in the rats given NQO alone. The incidence of adenocarcinomas in the glandular stomach was also higher in the groups given MNNG plus NaCl than in the animals given MNNG alone; poorly differentiated adenocarcinomas were detected only in the animals treated with MNNG plus NaCl. Some tumors were found in the large and small intestines, liver, pancreas, and omentum

n the MNNG-treated rats, and metastases to the
ymph nodes or liver were seen in some of the car-
inogen-treated rats. No malignant tumors were de-
ected outside the gastrointestinal tract in any
roup. The data indicate that NaCl alone is not car-
inogenic, but that it enhances the carcinogenic
ffects of MNNG and NQO in the rat stomach. NaCl
ppears to enhance the penetration of the carcinogens
ıt probably is not a 'promoter'.

49 EFFECT OF ZOLIMIDINE, A DERIVATIVE OF IMI-
DAZO (1,2-a) PYRIDINE, ON THE GASTRIC MU-
)SA OF PATIENTS WITH GASTRIC DISORDERS. *(E.)* Celli,
; Clementi, F.; Santagostino, C. (Maggiore Hosp.,
lan, Italy). *Curr. Ther. Res.* 18(1):105-123, 1975.

ıe morphology of the gastric mucosa before and after
reatment with zolimidine by endoscopic, histological
ıd ultrastructural analysis of a single mucosal zone
ıs studied. Biopsy specimens were taken from ten
ıtients with various gastric abnormalities under
edical treatment. Tissues were fixed in formalde-
'de, and stained with PAS or uranyl acetate and lead
trate. Studies were made before and after p.o.
lministration of the drug (800 mg/day) for 4 wks. In
ur patients with advanced ulcer the drug produced a
ear surfacing of the ulcer, with disappearance of
ıe subjective symptoms. Histological examination
ıowed satisfactory healing of the tissues. Electron
croscopy revealed a completely normal cellular in-
astructure. The presence of a greater number of
ıcous granules was noted in the apical zone as well
; more frequent exocytosis. In three cases of in-
ammatory and erosive gastropathy, repair of the
sion was obtained, and in one other case there
ıs a return to normality. An effect of the drug
ı the mucosal barrier was demonstrated in all cases.
ıese results demonstrate that the drug does not
oduce intracellular lesions, has mucopoietic
tivity and acts positively on the gastric bar-
er in reproductive, reparative, defensive and
ınctional processes.

50 GASTRIC EMPTYING FOLLOWING VAGOTOMY AND
ANTRECTOMY AND PROXIMAL GASTRIC VAGOTOMY.
.) Kalbasi, H.; Hudson, F. R.; Herring, A.; Moss,
; Glass, H. I.; Spencer, J. (Hammersmith Hosp.,
ndon, England). *Gut* 16(7):509-513, 1975.

e effects of posture, vagotomy and antrectomy, and
oximal gastric vagotomy on the gastric emptying of
standard physiological solid meal (eggs, toast,
tter, jam, milk) labeled with ^{129}Cs were studied
19 patients who had undergone proximal gastric
gotomy and 16 patients who had undergone truncal
gotomy and antrectomy for duodenal ulcer. The
udies were performed 1, 4, 6, and 12 months after
rgery. On completion of the test meal, the sub-
cts were placed in a supine or sitting position
der the gamma camera and data collection was begun
thin 5 min of the end of the meal; the study was
ntinued for 90 min. Gastric emptying was signifi-
ntly slower in the vagotomy plus antrectomy group
month after surgery than in a healthy control group.
e difference was reduced at 4 months, and gastric emptying in the surgery group was normal at 6 months. At no stage did the proximal gastric vagotomy patients differ significantly from the controls in this respect. Symptoms of epigastric fullness were significantly more frequent in the vagotomy plus antrectomy patients than in the proximal vagotomy patients. Gastric emptying was similar in the supine and sitting positions in all groups, but the vagotomy plus antrectomy patients cleared significantly less of the meal in both positions than did the controls; again, the proximal vagotomy patients did not differ significantly from the controls. It is concluded that any differences in gastric emptying patterns which can be attributed to the effect of posture are of small scale and are restricted to particular groups of patients, such as those with rapid emptying patterns. However, future studies should employ the sitting position as this is closer to normal conditions.

7151 THE ROLE OF ACID AND ISCHEMIA IN PRODUCTION OF STRESS ULCERS DURING CANINE HEMORRHAGIC SHOCK. *(E.)* Zinner, M. J.; Turtinen, L.; Gurll, N. J. (Walter Reed Army Medical Center, Washington, D.C. 20012). *Surgery* 77(6):807-816, 1975.

Twenty adult mongrel dogs with an internally drained Heidenhain pouch were divided into three groups (Group 1, ten animals bled to 45 mm Hg mean arterial pressure and exposed to acid through the pouch; Group 2, seven controls; Group 3, three animals bled to a 45 mm Hg mean arterial pressure without acid exposure). The groups were studied for variations in electrical potential difference (PD), aminopyrine clearance, and net H_2O, Na^+, H^+, K^+, and Cl^- flux. PD was measured through a bridge from the femoral vein to the gastric lumen. Aminopyrine was infused as an i.v. dose of 20 mg/kg and maintained at 5 mg/kg/hr. Clearance was measured as an indicator of mucosal blood flow. Acid test solution (80 mM of HCl, 80 mM of NaCl, 1.5 g/l of polyethylene glycol) was instilled in the pouch, left for 30 min, then drained and replaced by a solution lacking the glycol. Total pouch flow decreased from 37 ml/min to 6 ml/min in group 1 while it remained stable (32 ml/min in controls and 24 ml/min after 5 hrs) in group 2. PD in group 1 decreased from 54 mV to 25 mV, while it remained stable at 57 mV in group 2. Na^+ and H^+ flux remained stable in both groups, while Cl^- fell from a control of 56.8 μEq/30 min/100 cc to -11.7 μEq/30 min/100 cc in group 1. K^+ flux increased from 2.3 μEq/30 min/100 cc to 10.5 μEq/30 min/100 cc in group 1 and remained stable in group 2. Nine of ten pouches in group 1 showed superficial erosions by gross examination, while none in the other groups demonstrated lesions. It appears that K^+ flux may reflect loss of mucosal integrity, rather than Na^+ or H^+, and that acid is a necessary component in the pathogenesis of stress ulcer.

7152 STUDIES CONCERNING THE APPEARANCE OF THE LESION IN THE UPPER PORTION OF THE INDIRECT GASTRIC RADIOGRAPH OF MASS EXAMINATION. *(Jpn.)* Miura, T.; Hachiya, T.; Oishi, H.; Aburatani, R.; Takahashi, H.; Hamada, N.; Shibathuji, H.; Shunagawa, M.; Kondo, H.; Fukuyama, T. (Nara Medical Univ. Cancer Center, Japan). *J. Nara Med. Assoc.* 25(4,5):378-386, 1974.

7153 APPLICATION OF DIRECT pH MEASUREMENT IN THE STOMACH TO CLINICAL GASTROENTEROLOGY AND BALNEOLOGICAL RESEARCH. *(Ger.)* Skapik, V. M.; Cap, J.; Kyral, V.; Chvatalova, M. (Marianske Lazne Balneol. Research Inst., USSR). *Z. Physiother.* 26(6): 401-411, 1974.

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7157 PROGRESS AND PROSPECT IN DIAGNOSIS OF GASTRIC CANCER. *(Jpn.)* Sato, H. (Sch. of Medicine, Kagoshima Univ., Kagoshima, Japan). *Igaku Kenkyu (Acta Medicina)* 44(2):1-25, 1974.

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7164 ENDOSCOPIC CANNULATION OF THE PAPILLA OF VATER IN POST-GASTRECTOMY PATIENTS WITH BILLROTH II GASTROJEJUNOSTOMY. *(E.)* Galford, W. D. (Latter-day Saints Hosp., Salt Lake City, Utah). *Gastroenterology* 68(4):1028, 1975.

7165 SCANNING ELECTRON MICROSCOPY OF GASTROSCOPIC BIOPSIES. *(E.)* Fard, E.; Schuman, B. M. (Henry Ford Hosp., Detroit, Mich.). *Gastroenterology* 68(4):1025, 1975.

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7199 HISTOCHEMICAL STUDY OF GASTRIC MUCOSUBSTANCES AFTER THERMAL INJURY: CORRELATION WITH ENDOSCOPIC EVIDENCE OF ACUTE GASTRODUODENAL DISEASE. *(E.)* McAlhany Jr., J. C.; Czaja, A.; Cathcart III, R. S.; Spicer, S. S.; Foley, F. D.; Pruitt Jr., B. A. (Brooke Army Medical Center, Fort Sam Houston, Tex.). *J. Trauma* 15(7):609-612, 1975.

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7202 "TRENCH ULCER" OF THE STOMACH. A STUDY OF 14 CASES. *(E.)* Kamada, T.; Fusamoto, H.; Masuzawa, M.; Hiramatsu, K.; Fukui, O. (Osaka Univ. Medical Sch., 3 Dojimahamadori Fukushima-ku, Osaka 553, Japan). *Am. J. Gastroenterol.* 63(6):486-489, 1975.

7203 ELECTROCOAGULATION OF BLEEDING IN THE UPPER PART OF THE GASTROINTESTINAL TRACT. A PRELIMINARY EXPERIMENTAL CLINICAL REPORT. *(E.)* Sugawa, C.; Shier, M.; Lucas, C. E.; Walt, A. J. (Dept. Surgery, Wayne State Univ., 540 E. Canfield Ave., Detroit, Mich. 48201). *Arch. Surg.* 110(8): 975-979, 1975.

7204 CANCER OF THE GASTRIC STUMP FOLLOWING OPERATIONS FOR BENIGN GASTRIC OR DUODENAL ULCERS. *(E.)* Gazzola, L. M.; Saegesser, F. (Montefiore Hosp., Univ. Pittsburgh, Pittsburgh, Pa.). *J. Surg. Oncol.* 7(4):293-298, 1975.

7205 SPONTANEOUS GASTRIC RUPTURE IN THE NEWBORN: A CLINICAL REVIEW OF NINETEEN CASES. *(E.)* Shashikumar, V. L.; Bassuk, A.; Pilling IV, G. P.; Cresson, S. L. (Temple Univ. Sch. Medicine, 2600 N. Lawrence Street, Philadelphia, Pa. 19133). *Ann. Surg.* 182(1):22-25, 1975.

7206 GASTRIC CANCER IN CHILE: A COOPERATIVE INTERHOSPITAL STUDY I. CLINICAL FINDINGS AND DIAGNOSIS. *(E.)* Csendes, A. (Hosp. Jose Joaquin Aguirre, Santiago, Chile). *Jpn. J. Clin. Oncol.* 5(1):41-46, 1975.

7207 GASTRIC CANCER IN CHILE: A COOPERATIVE INTERHOSPITAL STUDY II: TREATMENT AND POSTOPERATIVE EVOLUTION. *(E.)* Csendes, A. (Hosp. Jose Joaquin Aguirre, Santiago, Chile). *Jpn. J. Clin. Oncol.* 5(1):47-52, 1975.

See also, 6744, 6980, 6982, 7004, 7009, 7013, 7035, 7043, 7064, 7065, 7069, 7075, 7092, 7097, 7101, 7109, 7124, 7217, 7235, 7243, 7246, 7247, 7248, 7275, 7276, 7277, 7292, 7298, 7314, 7321, 7340, 7396, 7407, 7613, 7772, 7773, 7782, 7848, 7855, 7860, 7864, 7865, 7867, 7872, 7876, 7884, 7910.

STOMACH

Peptic Ulcers

7208 ESOPHAGITIS AND DUODENAL ULCER. *(E.)* de Moraes-Filho, J. P. P.; Zaterka, S.; Pinotti, H. W.; Bettarello, A. (Sao Paulo Sch. Medicine, Sao Paulo, Brazil). *Digestion* 11(5-6):338-346, 1975.

The incidence of reflux esophagitis and the manometric characteristics of the lower esophageal sphincter in 35 male duodenal ulcer patients was investigated. All patients were submitted to radiological examination of the esophagus, esophagoscopy, histologic study, manometric study of the lower sphincter of esophagus, a study of the gastric secretion of HCl, and statistical analysis. No radiological signs of mucosal fold alterations or strictures were observed in any patients. Esophagoscopy showed esophagitis in 12 of 36 patients. Inflammatory histological mucosal alterations were observed in 21 of the patients. The final diagnosis of esophagitis was established by endoscopy and/or histology in 22 patients. Basal and histalog-stimulated secretion was normal in 11 cases; basal was increased but histalog-stimulated secretion was normal in four cases; both basal and histalog-stimulated were increased in 13 cases; and basal was normal but histalog-stimulated secretions were increased in eight cases. There was no significant difference between the mean values of the resting gastroesophageal sphincter pressure and the length of the lower esophageal sphincter of the controls and the different groups (with and without esophagitis, presence or absence of duodenal narrowing, hypersecretion or normal secretion of HCL). The results show that alterations of esophageal mucosa are related neither to the duration of the ulcer disease nor to basal and histalog acid secretion. These findings suggest that esophageal mucosa is sensitive to regurgitated gastric secretion of its acid content. Also, the intensity of the inflammatory reaction was not increased in the patients with longer histories of duodenal ulcers, indicating that a certain balance occurred between aggression and esophageal resistance.

7209 THE STUDY OF INCIDENCE AND CLINICAL SYMPTOMS OF PEPTIC ULCER IN CERTAIN OCCUPATIONAL GROUPS.

(Bul.) Stoianova, Z.; Stancheva, P.; Vlakhov, I. (Inst. Gastroenterology, Sofia, Bulgaria). *Vutr. Boles.* 13(3):70-77, 1974.

The incidence of peptic ulcer was studied in 2,979 female and 999 male workers in different occupational groups. The overall incidence of peptic ulcer was 3.8%; 3.1% in females and 5.8% in males. The incidence was highest in employees of the telephone company (14.2%); the incidence was 6.3% in steel workers, 6% in clothing factory workers, 2.7% in textile factory workers, and 2.3% in rubber factory workers. The age classes 20 to 30 yr, 31 to 40 yr, 41 to 50 yr and over 50 yr accounted for 20.8%, 43.6%, 27.5% and 8.1%, resp., of all cases. Peptic ulcer was localized in the duodenum in 95.3%, and in the stomach in 4.7% of all cases. Melena was established in 12.8%, hematemesis with melena in 2%, and stenosis of the pylorus in 0.7% of all cases. The incidence of neurasthenic syndrome was highest in the occupational groups with the highest incidence of peptic ulcer.

7210 GASTRIN DETERMINATIONS IN SYMPTOMATIC PATIENTS BEFORE AND AFTER STANDARD ULCER OPERATIONS.

(E.) Stremple, J. F.; Elliott, D. W. (Univ. Pittsburgh Sch. Medicine, Pa.). *Arch. Surg.* 110(8):875-879, 1975.

Gastric acid secretion and serum gastrin levels in a wide variety of clinical conditions were compared in 157 subjects without ulcer and 157 patients with either primary or recurrent ulcer. The non-ulcer group included 125 patients with gastritis, reflux esophagitis, anephria, short gut syndrome, primary hyperparathyroidism and a gastrin-producing adenoma, and 32 normal subjects. Neither the mean fasting nor the mean postprandial serum gastrin levels in patient controls differed from these values in normal controls. There was no significant difference between basal or maximum acid output in normal controls (2.2 and 16.8 mEq/hr, resp.) compared to patients with gastric ulcer (2.1 and 19.5 mEq/hr, resp.). Patients with duodenal ulcers had markedly elevated mean basal and maximum acid outputs (5.2 and 34.1 mEq/hr, resp.) compared to normals and gastric ulcer patients. Fasting mean serum gastrin levels were 45 pg/ml in normal subjects and 43 pg/ml in duodenal ulcer patients compared to postprandial values of 75 and 77 pg/ml, resp. These differences were not significant. Patients after vagotomy and Billroth I or II operations had lower basal and maximum acid outputs after surgery than normals. Patients after vagotomy and Billroth II procedures had elevated fasting serum gastrin levels that decreased postprandially. Patients with recurrent ulcer after incomplete vagotomy and gastric resection had high gastric acid secretion and normal serum gastrin levels. Patients with recurrent ulcer after complete vagotomy and gastric resection with retained antrum had both high acid output and high fasting and postprandial serum gastrin levels. Basal acid outputs and serum gastrin levels were even more elevated in patients with the Zollinger-Ellison syndrome. These results demonstrate that basic gastric acid secretory studies in combination with serum gastrin determinations can aid in the diagnosis of the Zollinger-Ellison syndrome and recurrent ulcers.

7211 BLOOD FLOW DISTRIBUTION IN THE STOMACH OF CATS WITH GASTRIC ULCER.

(E.) Skarstein, A.; Svanes, K. (Dep. General Surgery, Univ. Bergen, Norway). *Scand. J. Gastroenterol.* 10(4):339-345, 1975.

The blood flow distribution in the stomach of cats with a one-week gastric ulcer was investigated. Ulcer was induced in the anterior wall of the antrum by a subserous injection of 0.3 ml of a 20% acetic acid solution; controls were laparotomized only. Carbonized microspheres 15 ± 5μ in diameter and labeled with ^{169}Yb were used to measure blood flow in different regions and layers of the stomach. Approximately 2-3 million microspheres were injected into the left ventricle of the heart. Simultaneously a blood sample was drawn from the distal aorta at a flow of 1 ml/min. Standardized tissue samples were punched from the lesser curvature and the anterior and posterior walls of the antrum, corpus and fundus. In each sample the mucosa was separated from the muscularis. The radioactivity of blood and tissue samples was determined, and the blood flow was calculated for each tissue sample. Three groups of animals were examined: anaesthetized control animals; animals laparotomized one wk before examination, and animals with a one-week ulcer. In the control animals the blood flow was the same in corresponding regions of the anterior and posterior walls of the stomach. The flow was slightly lower in the antrum than the fundus. The flow was similar in the different regions of the muscularis. The muscularis flow was markedly lower than the mucosa flow. In the laparotomized animals, the blood flow was increased in the muscularis of the corpus. In the ulcer animals, the mucosa flow was increased in the anterior wall of the antrum, and the muscularis flow was increased in the antrum and the anterior wall of the corpus. The results strongly suggest that gastrointestinal surgery with rough handling of the intestines is associated with marked circulatory changes in the abdominal organs.

7212 SERUM GROUP I PEPSINOGENS BY RADIOIMMUNOASSAY IN CONTROL SUBJECTS AND PATIENTS WITH PEPTIC ULCER. *(E.)* Samloff, M.; Liebman, W. M.; Panitch, N. M. (Harbor General Hosp., 1000 West Carson St., Torrance, Calif. 90509). *Gastroenterology* 69(1):83-90, 1975.

Serum group I pepsinogen levels were compared in 300 healthy controls, 389 patients without peptic ulcer, 136 patients with peptic ulcer, and seven with the Zollinger-Ellison syndrome. The mean serum group I pepsinogen levels in healthy and hospital controls were 110.6 and 100.0 ng/ml, resp., and in both groups were significantly higher in males than in females. Values for approximately 90% of the healthy controls ranged from 50 to 175 ng/ml, and this was determined as normal. The mean serum group I pepsinogen level was 410.6 ng/ml in 55 cases with serum urea nitrogen over 21 ng/100 ml. A high value was found in 39 (70.9%) of these patients. The mean serum group I pepsinogen level in 37 patients with chronic alcoholism was 73.4 ng/ml; in 46 cases with gastric ulcer, 116.6 ng/ml; in 18 with prepyloric ulcer, 179.4 ng/ml; in 13 with both duodenal and gastric ulcer, 177.2 ng/ml; and in 77 with duodenal ulcer, 221.3 ng/ml, median level 203.0 ng/ml. None of the patients in this last group had a low value, and 49 (63.6%) had levels over 175 ng/ml. These patients had significantly higher ($P < 0.001$) mean levels of serum group I pepsinogen than healthy male controls. Serum group I pepsinogen values ranged from 315 to 921 ng/ml (mean, 503.9 ng/ml) in patients with the Zollinger-Ellison syndrome. These data indicate that in comparison to healthy controls, patients with prepyloric ulcer, duodenal ulcer and the Zollinger-Ellison syndrome have significantly increased levels of serum group I pepsinogen, that patients with gastric ulcer have comparable values, and that those with chronic alcoholism have significantly decreased levels.

7213 STUDIES ON THE BINDING OF AMYLOPECTIN SULFATE WITH GASTRIC MUCIN. *(E.)* Kim, Y. S.; Bella, A.; Whitehead, J. S.; Isaacs, R.; Remer, L. (Veterans Administration Hosp., 4150 Clement St., San Francisco, Calif. 94121). *Gastroenterology* 69(1):138-145, 1975.

Binding of canine gastric mucin to amylopectin sulfate gel was studied by chemical assay for reducing sugars and by column chromatography. Hydrated amylopectin sulfate gel (4 ml) was washed with 0.1 M citric acid-phosphate buffer (pH 7.0), and centrifuged at 48000 x *g* for 20 min. One ml of 0.8 mg/ml of mucin solution was added, the pH was adjusted in the range from 3 to 7 and the mixture placed in a 25 C bath for 2 hr, then centrifuged at 48000 x *g* for 20 min. The supernatant was decanted, filtered and assayed for reducing sugars as the determination of unbound mucin. Pasteur pipettes lined with glass wool were saturated with amylopectin sulfate and 0.02 M citrate-phosphate buffer (pH 3). The effluent was measured and assayed for neutral sugars and pH. Mucin (10-20 mg/ml) was incubated with aqueous amylopectin sulfate (10-50 mg/ml) for 30 min at 25 C. Aliquots of 25 µl were used for electrophoresis at various pH values. At pH 3 and pH 4, 65 to 85% of the mucin fraction was bound to the gel, while at pH 7, only 35 to 40% was bound. On column chromatography, one mucin fraction did not bind, while a second eluted at pH 4.5. When pepsin was applied to the column, it eluted upon application, except at pH 2. The mucin bands which remained at the origin on electrophoresis were bound by amylopectin sulfate, while those which migrated did not bind. It appears that there is little difference between the fractions which bound to amylopectin sulfate and those which failed to do so. It is suggested that pepsin-amylopectin sulfate interaction occurs only in states of excessive acid secretion.

7214 INHIBITION OF GASTRIC ACID SECRETION BY CIMETIDINE IN PATIENTS WITH DUODENAL ULCER. *(E.)* Henn, R. M.; Isenberg, J. I.; Maxwell, V.; Sturdevant, R. A. L. (Veterans Admin. Wadsworth Hosp. Center, Los Angeles, Calif.). *N. Engl. J. Med.* 293 (8):371-375, 1975.

The effect of cimetidine, a nonthiourea-containing H_2-receptor antagonist, on basal and meal-stimulated gastric acid secretion was studied in seven males with duodenal ulcer (age range, 36-63 yr). The effects of cimetidine and an optimally effective dose of an anticholinergic, propantheline bromide, on meal-stimulated gastric acid secretion were compared. Eight cimetidine tests (four basal and four meal-stimulated) were performed on separate days, in random order, and in double-blind fashion. Each dose of cimetidine markedly decreased gastric acid secretion as compared with either basal or acid secretion after placebo; mean gastric acid content of stomach aspirate 1 hr after placebo and cimetidine doses of 100, 200 and 300 mg were 0.9, 0.3, 0.4 and 0.1 mEq/hr, resp. Three hundred mg of cimetidine decreased mean basal acid secretion to almost zero for 5 hr. The increasing doses of cimetidine produced graded increases in mean blood concentrations. Cimetidine and optimal propentheline bromide each decreased meal-stimulated acid secretion; however, 300 mg of cimetidine produced greater mean secretory inhibition which lasted through three hr. Inhibition of gastric acid output was positively correlated with blood cimetidine concentrations. No effect on serum gastrin response to a peptone meal or evidence of clinical or biochemical abnormalities in serial acute tests were observed following cimetidine ingestion. Thus, cimetidine was a potent inhibitor of both basal and meal-stimulated gastric acid secretion, and its effects were dose-related. Because of its effectiveness in inhibiting gastric acid secretion, superior potency to anticholinergics, and the lack of acute side effects, cimetidine is suggested as a potential therapeutic agent for the treatment of patients with peptic ulcer disease provided no toxicity appears with chronic testing.

7215 A COMPARISON OF THE ACID NEUTRALIZING EFFECTS OF A COMBINATION OF ANTACID PLUS OXETHAZAINE (OXAINE M) COMPARED TO ANTACID ALONE (ALUDROX) IN DUODENAL ULCER PATIENTS.

(E.) Novaes, C. C.; Richards, D. J.; Davis, G. R. (Santa Helena Hosp., Recife, Pernambuco, Brazil). *Curr. Ther. Res.* 18(1):124-131, 1975.

The effects of antacid and of antacid combined with oxethazaine on the development of gastric alkalinity and recovery of acidity were studied in 20 duodenal ulcer patients under maximal stimulation by a histamine analogue. Each patient received antacid/oxethazaine and antacid on successive days. The pH of the gastric milieu was continuously measured using a radiotelemetry capsule which was swallowed and positioned in the most dependent portion of the stomach. The histamine analogue was administered s.c. at a dose of 1.7 mg/kg; 60 min later, the antacid medications were administered by gastric tube. Anacidity was defined as a gastric pH of 3.5 or higher. Since the baseline pH values in the duodenal ulcer patients were quite low, the histamine analogue often produced little or no stimulation of gastric acidity. The mean peak pH produced by the oxethazaine/antacid mediation (5.29) was significantly greater than that produced by the antacid alone (4.5), and the mean duration of anacidity was longer after the oxethazaine combination (4.42 min) than after the antacid alone (2.74). The mean overall time period from medication administration to peak pH was nearly the same for both medications, as was the time required for return to pH 3.5 after attainment of the peak value. The oxethazaine/antacid effect could have been the result of an oxethazaine-induced increase in gastric pH, decrease in gastric acid secretion, and decrease in gastrin level.

7216 SERUM GASTRIN RESPONSE TO FOOD STIMULATION AND GASTRIC ACID SECRETION IN MALE PATIENTS WITH DUODENAL ULCER.

(E.) Gedde-Dahl, D. (Rikshospitalet, Oslo, Norway). *Gut* 16(1):189-191, 1975.

The gastrin response to a test meal was recorded in nine male patients with duodenal ulcer, related to their gastric acid secretion before and after stimulation with pentagastrin, and compared with the findings in male controls. The serum gastrin concentrations were determined by radioimmunoassay, and gastric secretion of acid was determined before and after stimulation with 6 μg pentagastrin/kg given s.c. The patterns of gastrin response was biphasic, with an early maximum of the first peak in the patients *versus* a monophasic response with a maximum in the second hr in the controls. The mean value of basal acid outputs (BAO), both per subject and per kg, was significantly higher in the duodenal ulcer groups than in the controls; the mean values for maximal acid outputs (MAO) was not significantly different. There was a positive correlation between weight-adjusted BAO and MAO in controls, but not in the patients. The mean fasting serum gastrin concentration in the duodenal ulcer group, 109 ± 24.5 pg/ml, was significantly higher than in the control group, 42 ± 5.5 pg/ml. BAO values in the duodenal ulcer group correlated positively with the fasting serum gastrin concentration, total gastrin output, and the integrated gastrin response. The results indicate that the acid inhibitory feedback mechanism may be impaired in patients with duodenal ulcer disease.

7217 STIMULATION OF HUMAN PEPSIN OUTPUT BY TOPICAL HYDROCHLORIC ACID.

(E.) Bynum, T. E.; Johnson, L. R. (Baylor Coll. Medicine, Houston, Tex.). *Dig. Dis.* 20(7):607-612, 1975.

The presence in man of an acid-sensitive reflex similar to that demonstrated in the dog was studied for its relation to ulcer disease. Pepsin output and concentration were measured from the stomach of healthy subjects during irrigation with phosphate buffer or 0.2 N HCl during twelve 15-min periods. There was a highly significant 4-fold increase in pepsin output and a three-fold increase in pepsin concentration after introduction of 0.2 N HCl. Secretion of pepsin increased immediately in the first period and remained at a high sustained level for the entire hour of perfusion. Pepsin output fell to control levels immediately following reintroduction of phosphate buffer. Pepsin outputs after 0.15 N HCl were lower than after the higher concentration, but this difference was not statistically significant. These results indicate that pepsin output increases significantly during acidification of the gastric mucosa in man, and may play a significant pathogenic role in ulcer production.

7218 RELIEF OF DUODENAL ULCER SYMPTOMS BY ORAL METIAMIDE.

(E.) Pounder, R. E.; Williams, J. G.; Milton-Thompson, G. J.; Misiewicz, J. J. (Central Middlesex Hosp., London, NW10 7NS, England). *Br. Med. J.* 2(5966):307-309, 1975.

A double-blind clinical trial of oral metiamide and a placebo was performed on 30 duodenal ulcer patients to determine its effect on symptoms and antacid consumption in this disease. Treatment consisted of 200-mg metiamide tablets, 3 times/day after meals and 400 mg at night (15 patients) or the same amount of lactose-placebo (15). All subjects were followed at least 5 weeks, and 23 were treated for 8 weeks. Metiamide treatment produced a significant reduction of both day and night pain, and patients on placebo experienced more severe pain than those receiving metiamide. Patients on metiamide consumed significantly less antacid during weeks 2, 3 and 5 than controls. There were no adverse effects reported by any patient. Mild side effects (sedation, headache and dizziness) were reported by ten patients on metiamide and five controls, but these effects were not severe. It is suggested that treatment with an H_2-receptor antagonist produces an early remission of duodenal ulcer.

7219 ASPECTS OF THE EFFECT OF METIAMIDE ON PENTAGASTRIN-STIMULATED AND BASAL GASTRIC SECRETION OF ACID AND PEPSIN IN MAN.

(E.) Thjodleifsson, B.; Wormsley, K. G. (Dept. Therapeutics, Univ. Dundee, Dundee, Scotland). *Gut* 16(7):501-508, 1975.

The pharmacological effects of metiamide on gastric acid and pepsin secretory inhibition were studied in 13 patients with duodenal (DU) and three with gastric ulcer (GU) to provide a basis for metiamide dose requirements in peptic ulcer treatment. The effect of metiamide on the response to a range of pentagastrin doses (0.05, 0.2, 1.0, and 4.0 µg/kg/hr for 60 min) in three normal subjects was determined, as was the interaction of metiamide and atropine on prolonged basal secretion. Pentagastrin infusion followed one of two dose schedules: i.v. bolus of 75 mg (Schedule I) or 20 mg (Schedule II), followed by continuous infusion of 30 mg during 60 min. Metiamide was injected, i.v., 10 min before the start and during the course of pentagastrin infusion. Gastric secretion of acid and pepsin was inhibited more in patients with GU than DU and gastric acid secretory inhibition was significantly greater than pepsin inhibition for all concentrations of metiamide. The mean calculated maximal response to pentagastrin was progressively depressed from 16.2 (control value) to 8.9 mM/30 min (schedule II) and further reduced to 6.1 mM/30 min (schedule I). The ED_{50} of pentagastrin increased from 0.15 to 0.32 µg/kg/hr (II) and to 0.90 µg/kg/hr (I). Thus, metiamide inhibited both the maximal secretory response attainable with pentagastrin and decreased the sensitivity to pentagastrin. Atropine augmented and prolonged the action of metiamide. The powerful inhibitory action of metiamide on gastric secretion may have therapeutic value in treatment of diseases in which acid and pepsin secretion play an etiological role. However, the degree of secretory inhibition necessary to permit healing of mucosal lesions remains unknown.

7220 GASTRIC SECRETORY INHIBITION BY TWO 16-METHYLATED ANALOGS OF PROSTAGLANDIN E_2 GIVEN INTRAGASTRICALLY TO PATIENTS WITH DUODENAL ULCER DISEASE.

(E.) Nylander, B.; Andersson, S. (Dep. Internal Medicine, Karolinska Hosp., Stockholm, Sweden). *Gut* 16(1):217-220, 1975.

The effects of two methylated analogs of prostaglandin E_2 (PGE_2), 16,16-dimethyl PGE_2 and its methyl ester, on gastric acid and pepsin secretion were studied in five ulcer patients. The gastric residuum was removed twice and radiovitamin B_{12} was used as an indicator for the recovery of gastric juice. Gastric juice was collected continuously in 15-min samples. The mean control secretory rate of the five ulcer patients was 45 mEq/hr compared with 25 mEq/hr for controls. With 80 µg of 16,16-diMe PGE_2 the median pH of residuum I was 1.6 and that of residuum II, 5.9, indicating inhibition of basal gastric secretion. Concentrations of 80 and 140 µg of both compounds gave a dose-dependent decrease in acid output. It was necessary to give 140 µg of each analog to reach about the median effective dose. The mean values of pepsin output and pepsin concentration were decreased following administration of PGE_2, but the individual results varied. The results show that these two prostaglandin analogs inhibit gastric acid secretion in duodenal ulcer patients in a dose-dependent fashion and that the inhibition is mainly due to a reduction of volume, contributing to about 60% of the overall reduction of acid output.

7221 EFFECT OF SEROTONIN AND ENDOTOXIN ON ACUTE GASTRIC STRESS ULCERATION IN CONVENTIONAL AND GERM-FREE RATS.

(E.) Batson, R. C.; Greenberg, P. H.; Nance, F. C. (Louisiana State Univ. Sch. Medicine, New Orleans, La.). *Surg. Forum* 24:426-428, 1973.

The effects of endotoxin and 5-hydroxytryptamine on conventional and germ-free mice subjected to restraint stress were studied. After fasting, 80 conventional and 40 germ-free mice were randomly divided into four groups, receiving i.p. injections of: 5-hydroxytryptamine (10 mg/kg); endotoxin (4 mg/kg); endotoxin plus 5-hydroxytryptamine, or saline. Animals were sacrificed 24 hr after being restrained by stapling between two pieces of screen wire. Restrained, germ-free mice had significantly fewer ulcers than conventional mice. Endotoxin alone had no effect on ulceration in either strain. Serotonin resulted in an increase in both the incidence and severity of ulcerations in both strains. Endotoxin and serotonin in combination induced a greater number of ulcers than serotonin alone. Neither humoral factor increased the number of ulcers in germ-free mice to the level observed in conventional controls. It is concluded that the germ-free state gives significant protection from restraint-induced ulceration.

7222 GASTRIC ACID AND PEPSIN SECRETION IN PATIENTS UNDERGOING INTERMITTENT HEMODIALYSIS.

(Ger.) Pointner, H.; Flegel, U.; Schmidt, P.; Zazgornik, J.; Kopsa, H. (Med. Clin. I, Univ. Vienna, Austria). *Wein Klin. Wochenschr.* 86(22):693-696, 1974.

To evaluate the high incidence of gastrointestinal disturbances in uremia, gastric acid secretion and pepsin secretion were measured in 15 uremic patients undergoing biweekly hemodialysis. Eight of the patients had radiologically confirmed peptic ulcers and two had duodenal irritation without overt ulceration. One day before dialysis, fasting gastric juice was obtained in three 20 min periods (basal) and secretion was stimulated by pentagastrin (6 µg/kg body weight, s.c.). Gastric juice was obtained in six 15 min periods and the peak output was calculated from the two highest 15 min periods. The volume of the juice was measured. HCl concentration was measured by titration; pepsin activity was determined by a slight modification of the Anson and Mirsky method and expressed in mg of tyrosine. Mean basal acid output for all 15 patients was 3.9 mEq/hr; peak acid output was 25.3 mEq/hr; basal pepsin output was 20.2 mg tyrosine/hr; peak pepsin output was 71.4 mg tyrosine/hr. Gastric acid values from 30 normal individuals and pepsin values from five normal individuals did not differ from the values in the uremic patients. It is concluded that a multifactorial etiology must be assumed for ulceration in the cases studied. There was great variation of values between all patients but no correlation of acid or pepsin values to gastrointestinal disturbances. Mean blood urea nitrogen was 91.1 mg %, mean serum creatinine was 13.5 mg %, mean serum Ca was 9.2 mg % in the uremic patients. It is concluded that in uremic patients neither gastric acid secretion nor pepsin secretion is responsible for the high incidence of peptic ulceration and other gastrointestinal distrubances.

7223 BONE MINERAL AFTER PARTIAL GASTRECTOMY II.

(E.) Aukee, S.; Alhava, E. M.; Karjalainen, P. (Univ. Central Hosp., Kuopio, 70210 Kuopio 21, Finland). *Gut* 16(1):165-169, 1975.

Bone mineral measurements by the Americium-241 gamma ray attenuation method were performed on the cancellous bone of the left distal radius of three groups of ulcer patients (30 preoperative patients in Group I; 70 patients 3.3-8.5 yr post-1/3 gastrectomy and Billroth I reconstruction with selective vagotomy in 36 comprising Group II; 60 patients 15-18 yr post-2/3 gastrectomy and Billroth II reconstruction forming Group III) to study the mineral density of bone postoperatively. Group I did not differ significantly from controls (0.302 g/cc *versus* 0.301 in controls), nor did males in Group II (0.281 g/cc *versus* 0.289 in controls). Females in Group II showed significant decreases in mineral density (0.232 g/cc *versus* 0.260 in controls), as did all patients in group III (0.255 *versus* 0.289 in males and 0.230 *versus* 0.254 in females). When corrected for known diseases affecting bone metabolism, the decreased density in group III males was 9.3% and 9.4% in females. The mineral density of bone was decreased after ulcer surgery by approximately 10%, but this decrease did not appear to endanger the patients' health or well-being.

7224 DECREASE IN GASTRIC SECRETION DURING THE FIRST THREE MONTHS AFTER PROXIMAL GASTRIC VAGOTOMY IN DUODENAL ULCER PATIENTS.

(E.) Roland, M.; Berstad, A.; Liavag, I. (Aker Univ. Hosp., Oslo, Norway). *Scand. J. Gastroenterol.* 10(4):363-367, 1975.

Gastric secretion was stimulated by i.v. infusion of pentagastrin (15 μg/kg/hr) before and 10 and 90 days after proximal gastric vagotomy in 16 duodenal ulcer patients. Postoperatively, pentagastrin (15 μg/kg/hr) was also given in combination with carbacholine (2 μg/kg/hr). Mean acid output in response to pentagastrin alone was reduced by 48% and 64% at 10 and 90 days, resp., after vagotomy. Mean pentagastrin stimulated acid output and volume of gastric juice was significantly higher at 10 days than at 90 days after the operation. Mean pepsin output decreased also, but the decrease was not statistically significant. There was no significant effect of carbacholine on pentagastrin-stimulated acid output either at 10 or 90 days. Carbacholine increased pentagastrin stimulated volume of gastric juice significantly at 19 but not 90 days postoperatively. The effect of carbacholine on pentagastrin-stimulated pepsin output was significant both 10 and 90 days after the vagotomy. Pepsin output in response to pentagastrin plus carbacholine 10 days after the operation was not significantly different from preoperative values. At 10 days postoperatively the increase in pentagastrin stimulated volume of gastric juice by carbacholine was significantly greater than at 90 days. The corresponding differences of acid and pepsin outputs were not significant. It is concluded that the preoperative secretion of acid cannot be restored by a maximal dose of pentagastrin or by pentagastrin in combination with carbacholine either 10 or 90 days after proximal gastric vagotomy. The results show a significant decrease in maximal acid output from 10-90 days after vagotomy.

7225 LONG TERM EFFECT OF HIGHLY SELECTIVE VAGOTOMY ON BASAL AND MAXIMAL ACID OUTPUT IN MAN.

(E.) Greenall, M. J.; Lyndon, P. J.; Goligher, J. C.; Jonston, D. (General Infirmary, Leeds, England). *Gastroenterology* 68(6):1421-1425, 1975.

Basal acid output (BAO) and maximal acid output (MAO) were measured five yr after highly selective vagotomy (HSV) in 21 patients who had previously undergone serial testing of BAO and MAO for up to two yr after HSV. Gastric secretion was aspirated by continuous suction for a basal period of one hr and for one hr after the i.m. injection of 6 μg/kg of pentagastrin before operation and 10 μg/kg after operation. Stimulated acid output was expressed both as peak acid output to pentagastrin (PAO^{pg}) which was peak 30-min acid output multiplied by two, and as total hour output, the acid output in the hour after the pentagastrin injection. BAO was the total amount of acid secreted during the basal hour. BAO decreased from a mean of 1.7 mEq/hr at one yr after HSV to 1.4 mEq/hr at five yr after HSV (not significant). The mean reduction in BAO at five yr, compared with the preoperative BAO of 8.4 mEq/hr, was 79%. The mean peak acid response to PAO^{pg}, compared with the preoperative PAO^{pg} of 43 mEq/hr, was 51% at one year and 48% at five yr. Inasmuch as acid outputs seem unlikely to increase further after five yr, it is concluded that HSV produces a permanent reduction of about 80% in basal acid output and 50% in maximal acid output.

7226 A HISTOLOGICAL STUDY OF GASTRIC MUCOSA BEFORE AND AFTER PROXIMAL GASTRIC VAGOTOMY IN DUODENAL ULCER PATIENTS.

(E.) Roland, M.; Berstad, A.; Liavag, I. (Aker Univ. Hosp., Oslo, Norway). *Gut* 16(1):181-186, 1975.

Suction biopsies were taken from the body of the stomach in 29 duodenal ulcer patients before and after proximal gastric vagotomy (PGV) in order to study the degree of gastritis, the gastric mucosal thickness and the number of parietal cells/unit area. All patients had a negative insulin test three month after the operation. A pentagastrin test was performed within two weeks before and 3 and 12 months after PGV. Three months after PGV, basal and pentagastrin stimulated acid secretion were reduced by 82 and 64% of preoperative values, resp. Twelve months after the operation the corresponding figures were 63 and 56%. There was a similar acid reduction in patients with and without gastritis. The number of patients with atrophic gastritis increased from three before the operation to 11 three months after PGV. There was no further increase from three to 12 months postoperatively. The average thickness of gastric mucosa and the mean number of parietal cells/unit area before PGV did not show any significant change three months and one yr after the operation. There was a significant correlation between the number of parietal cells/unit area and maximal acid output before but not after PGV. Acid output/parietal cell was higher before PGV, suggesting that the decrease in gastric secretion after PGV cannot be attributed to the development of gastritis or reduction of parietal cell number.

7227 THE EFFECT OF ATROPINE AND VAGOTOMY ON THE SECRETION OF GASTRIC INTRINSIC FACTOR (IF) IN MAN. *(E.)* Vatn, M. H.; Semb, L. S.; Schrumpf, E. (Ulleval Univ. Hosp., Oslo 1, Norway). *Scand. J. Gastroenterol.* 10:59-64, 1975.

Concentrations of gastric intrinsic factor (IF), acid and pepsin in gastric secretions of eight duodenal ulcer patients treated with atropine (1 mg, i.v.) and seven patients successfully treated by proximal gastric vagotomy were compared during basal secretion and after stimulation by s.c. pentagastrin (6 mg/kg). Atropine was administered alone or coincidentally with pentagastrin. IF concentration was estimated by the hemoglobin-coated charcoal method. Atropine reduced the pentagastrin-stimulated increase in volume of gastric juice (208 ml, no atropine; 125 ml, with atropine), acid output (no atropine, 32.2 mEq; with atropine, 20.2 mEq), pepsin output (no atropine, 90.3 mg; with atropine, 22.8 mg), and IF output (10255 U *versus* 5364 with atropine), while concentrations of each did not differ significantly with atropine (acid, 119 mEq/l; pepsin, 453 mg/l; IF, 44 μ/l) or without atropine (acid, 119 mEq/l; pepsin, 538 mg/l; IF, 45 μ/l). Atropine reduced the volume of gastric juice (141 ml, basal, *versus* 52 ml, basal with atropine) and the acid concentration (70 mEq/l *versus* 52 mEq/l) and pepsin concentration (701 mg/l *versus* 547 mg/l) in gastric juice, while not altering the IF concentration in gastric juice (56 *versus* 49 μ/ml). Vagotomy reduced the concentration of acid (52 *versus* 29 mEq/l), while not altering the concentration of IF (42 *versus* 36 μ/ml) in gastric juice. The secretion of IF, acid and pepsin stimulated by pentagastrin was decreased by atropine, secondary to a reduction in the volume of gastric juice. Basal secretion of IF and IF concentration in gastric juice were unchanged by "medical" or surgical vagotomy.

7228 EARLY RESULTS OF VAGOTOMY COMBINED WITH OTHER OPERATIONS IN THE TREATMENT OF DUODENAL ULCERS AFTER EVALUATION BY PENTAGASTRIN TESTS. *(Ger.)* Helwing, E.; Heymann, H.; Schmolke, M.; Otten, G.; Stark, E. (Chirurgischen Klinik und Poliklinik, Univ. Tubingen, Tubingen, Germany). *Med. Welt* 26(2):68-71, 1975.

7229 WEATHER CONDITIONS FAVORABLE TO ULCER DISEASE. *(Ger.)* Josimovic, I. B. (Nordstadt Hosp., Hannover, Germany). *Med. Welt* 26(9):374-377, 1975.

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7292 CONTENT OF CATECHOLAMINES, ACETYLCHOLINE AND CHOLINESTERASE ACTIVITY OF THE GASTRIC TISSUES IN SOME COMPLICATIONS OF ULCER DISEASE. *(Rus.)* Mellin, V. M.; Drozdovskaya, G. M. (Dept. Hosp. Surg., Kiev Med. Inst., USSR). *Vrach. Delo* (3):59-63, 1975.

See also, 6789, 7047, 7064, 7092, 7116, 7136, 7141, 7145, 7151, 7158, 7160, 7161, 7167, 7172, 7191, 7193, 7204, 7321, 7866, 7884, 7898.

SMALL INTESTINE

7293 ACUTE DUODENITIS AND DUODENAL ULCERATION AFTER BURNS. CLINICAL AND PATHOLOGICAL CHARACTERISTICS. *(E.)* Czaja, A. J.; McAlhany, J. C.; Pruitt, Jr., B. A. (Brooke Army Med. Cent., Fort Sam Houston, Tex.). *JAMA* 232(6):621-624, 1975.

The clinical and pathological characteristics of Curling ulcer were defined by early and serial endoscopic examinations of the duodenum in 37 burned patients. Only two of these were women; the subjects ranged in age from 16 to 74 yr, with burn sizes ranging from 23% to 96% of the total body surface; mortality was 75.6%. Of 58 endoscopic procedures performed, there were no complications; 24 patients were studied within 72 hr after the burn and 13, 4-30 days later. Duodenal disease was present in 27 patients and occurred only in those with burns involving more than 38% of the total body surface. Erosive duodenitis was seen to occur in some patients within 12 hr after injury and was usually associated with acute gastric disease. Isolated duodenitis occurred only in patients with pancreatitis. Contrast roentgenograms did not reliably show the superficial mucosal disease. Duodenal ulcerations were present in 12 patients and developed on a background of diffuse superficial mucosal injury. Other complications in the patients' postburn course influenced disease progression. Hemorrhage occurred in six patients with duodenal disease, usually originating from a posterior duodenal ulcer. Uncomplicated ulcers invariably healed within 5 weeks after diagnosis. It is suggested that the goals of future investigations should be to define and control the factors that influence the progression or resolution of early superficial injury.

7294 MESENTERIC CYSTS: A CAUSE OF SMALL BOWEL OBSTRUCTION IN CHILDREN. *(E.)* Christensen, J. A.; Fuller, J. W.; Hallock, J. A.; Sherman, R. T. (Coll. Med., Univ. South Florida, Tampa). *Am. Surg.* 41(6):352-354, 1975.

A case of complete mechanical small bowel obstruction secondary to a mesenteric cyst in a 30-month-old girl is reported. The patient presented with a 4-day history of constipation, abdominal pain, and vomiting. Her abdomen was moderately distended and X-rays showed multiple air fluid levels and loops of distended small bowel. The child's WBC was 11,000 mm^3 with 73% polymorphonuclear cells and 3% bands. Her hemoglobin was 12 g% and her hematocrit was 36 mm. Laparotomy revealed marked dilation of the proximal small bowel and volvulus of the ileum around a cyst in the pelvis. A multiloculated mesenteric cyst, containing chylous fluid and involving mesentery of the ileum, was identified. Attempts to enucleate the cyst were unsuccessful and accordingly the small bowel and mesentery involved by the cyst were resected. The patient was discharged on the 7th postoperative day. Since 1964, 13 patients under 10 yr with mesenteric cysts have been reported in the English literature. Ten patients presented with an abdominal mass or distention. Chronic abdominal pain was present in 3 and acute pain in 5. X-rays including contrast studies were helpful in 5 cases. Bowel obstruction was noted in 4 cases. The rectosigmoid mesentery is difficult to resect and if enucleation cannot be done, internal drainage into the free peritoneal cavity is the procedure of choice.

7295 GASTRIC SECRETION AND SERUM GASTRIN IN HUMAN SMALL BOWEL BYPASS.

(Eng.) Coyle, J. J.; Varco, R. L.; Buchwald, H. (Dept. Surgery, Univ. Minnesota, Minneapolis, Minn. 55455). *Arch. Surg.* 110(8):1036-1038, 1975.

The effect of massive small bowel bypass on basal and peak stimulated acid output and on the fasting serum gastrin level in man was studied. Jejunoileal bypass for massive obesity was performed on 37 patients. Gastric secretory studies were performed preoperatively and about 1 yr postoperatively. These patients underwent exclusion of the small bowel from 40 cm distal to the ligament of Treitz to 4 cm proximal to the ileocecal valve. A separate group of 26 patients who had undergone the same operation for obesity 2 yr prior to this time had fasting serum samples collected for measurement of gastrin levels. In the group of 37 patients, the average decrease in body weight was 43.4 kg during this first postoperative yr. The basal acid output stood at 1.95 mEq/hr preoperatively and 2.45 mEq/hr postoperatively. Peak stimulated acid output stood preoperatively at 14.80 mEq/30 min and 16.65 mEq/30 min postoperatively. Of the 37 patients, 24 showed increases in peak stimulated acid output (greater than 2 mEq/30 min in 16 patients). Clinically, 36 of these patients were asymptomatic with respect to possible gastric-related complaints. This study demonstrates no change in fasting serum gastrin levels of patients with massive intestinal bypass. It is suggested that the bypassed segment of the intestine may protect patients against fasting hypergastrinemia. However, the hormonal response to meals must be investigated in humans with small bowel bypass. The small, but statistically significant, increase in peak stimulated acid output was noted, but no clinical significance could be attached to it.

7296 LONG TERM CHANGES IN TOTAL BODY WATER, TOTAL EXCHANGEABLE SODIUM AND TOTAL BODY POTASSIUM BEFORE AND AFTER ILEOSTOMY.

(Eng.) Hill, G. L.; Goligher, J. C.; Smith, A. H.; Mair, W. S. J. (General Infirmary, Leeds, England). *Br. J. Surg.* 62(7):524-527, 1975.

Total body water, total body potassium and total exchangeable sodium were measured in ten patients (6 men and 4 women, aged 26-63 yr) with inflammatory bowel disease. The measurements were made before and 6 mo after a permanent ileostomy was established. All patients underwent elective surgery, but all were malnourished when the first measurement was made before surgery. Six mo after the operation, all patients were in good health and their ileostomies were functioning normally. As a group they had gained 6.8 kg in body weight and 372 mEq in total body potassium over this period of time. In calculating the normal total body water before surgery, a deficit of 12.4% for the group was found. This deficit was still present in 11.1% 6 mo after operation. The concentration of exchangeable sodium in the body water fell from an abnormally high level before surgery to within the normal range 6 mo later. From these data it is obvious that deficits in total body water occurring before surgery are not repaired in the 6 mo after the establishment of a well-functioning ileostomy. A reduction of total exchangeable sodium was still present in patients with an ileostomy who were otherwise well. It is suggested that patients with intractable inflammatory bowel disease achieve good nutrition and normal body composition before this type of surgery is performed.

7297 QUALITY OF LIFE: THE CONTINENT ILEOSTOMY.

(E.) King, S. A. (Stamford Hosp., Stamford, Conn.). *Ann. Surg.* 182(1):29-32, 1975.

Continent ileostomies (internal ileal reservoir or Kock Pouch) were constructed in 10 patients (five men and five women, aged 19-49 yr) suffering from ulcerative colitis (six), colitis (one), toxic megacolon (two), and mucosal disease (one). Of these 10 patients, nine were converted from a standard ileostomy with an external appliance to the continent ileostomy for various reasons. Of the nine, eight were converted successfully. Two patients suffered subsequent loss of continence due to reduction or intussusception of the nipple valve. In one of these two the adequacy of the pouch size seems to have a bearing on maintaining a satisfactory level of continence. The second patient is very much inconvenienced by varying levels of continence which are in part due to slow development of pouch size. Of three Type A reservoirs used, two have a satisfactory level of continence, albeit without full continence of flatus. The total failure is due to adhesions. Of seven Type C reservoirs, five are fully continent and have been so since surgery. The other two Type C patients became incontinent four months following surgery. A modification of the formation of the nipple by offsetting the mesentery to allow more complete suture placement may help in Type C reservoir patients. A dramatic improvement in life style was attested to by seven of the 10 patients, thus illustrating the high level of patient satisfaction with a continent ileostomy. The most common postoperative complication in this series was small bowel obstruction, occurring in three of the 10 patients. Due to episodes of obstruction related to peanuts, sesame seeds, and kernel corn, it is recommended that these patients irrigate their pouches weekly with tap water until clear. Two pouch suture line leaks occurred in these 10 patients, one of the major operative risk elements with this procedure. With experience, the internal reservoir procedure is probably as safe as most other major operative procedures. The elimination of the need for an external appliance, thus allowing a more normal life style, may encourage earlier operative intervention in patients with ulcerative colitis with a concomitant reduction in morbidity and mortality.

7298 CHANGES IN CANINE GASTRIC ACID OUTPUT AND SERUM GASTRIN LEVELS FOLLOWING MASSIVE SMALL INTESTINAL RESECTION. *(E.)* Wickbom, G.; Landor, J. H.; Bushkin, F. L.; McGuigan, J. E. (Univ. Florida Coll. Medicine, Gainesville 32610). *Gastroenterology* 69(2):448-452, 1975.

Gastric acid output and serum gastrin concentration, both basal and in response to feeding, were compared before and after massive resection of the small intestine. Four mongrel dogs were given Heidenhain pouches and 24 hr secretions were collected from them for a 4-wk period. Acid output was measured by titration. Dogs were fed once daily. Each dog had four feeding tests. After a 36 hr fast, pouch secretions were collected for 60 min and a venous blood sample was taken. Dogs were then fed horsemeat (420 g), and pouch secretions were collected for 6 hr. Blood samples were taken 1, 2, 3, 4 and 6 hr after feeding. The intestine was then resected from 10 in distal to the ligament of Treitz to 10 in proximal to the ileocecal junction. The same daily meal was reinstituted and secretions were collected every 24 hr. Each dog had the four feeding tests repeated. Mean acid output was 9.12 mEq prior to resection and 27.6 mEq after, a 176% increase. At 2 hr after the test meal, gastrin serum concentration (154 pg/ml) was significantly greater after resection than that prior to resection (86 pg/ml). Serum concentrations at 3, 4, 5 and 6 hr after resection significantly exceeded those prior to resection. For 6 hr after feeding there was a high correlation between increases in secretion and in serum gastrin. Integrated serum gastrin response was 2.95 ng/hr/mg prior to resection and 6.74 ng/hr/mg after resection, a 128% increase. It is concluded that gastrin may be responsible for increased acid levels after intestinal resection.

7299 IN VIVO EFFECT OF BILE SALTS AND CHOLESTYRAMINE ON INTESTINAL ANAEROBIC BACTERIA. *(E.)* Williams, R. C.; Showalter, R.; Kern, F., Jr. (Univ Colorado, Sch. Medicine, Denver, Colo. 80220). *Gastroenterology* 69(2):483-491, 1975.

The effect of bile salts on human intestinal anaerobic bacteria *in vivo* was studied. Five normal male subjects (21-26 yr of age) were intubated, serially, into the small bowel before and after administration of bile salts and/or cholestyramine. In two subjects after bile salt administration and in one after cholestyramine, all organisms subcultured were aerobic. Generally, bile salt feeding led to a decline in the number of anaerobic organisms in all five subjects. Ileal anaerobes also decreased after cholestyramine, but the effect was not confined to a certain genome; rather, whichever genome was present was affected. Ileal bile salt concentrations did not correlate with the number of anaerobes. But after cholestyramine administration, there was an increase in the proportion of cholate and decrease in chenodeoxycholate and deoxycholate. The proportion of unconjugated bile salts was low and was unchanged by bile salt or cholestyramine treatment. In *in vitro* studies, only the growth of *Gaffkya anaerobia* was inhibited by cholestyramine. These results are unexplained, but do agree with previous findings.

7300 MOLECULAR BIOLOGY IN OLD AGE: 5. ENZYME ACTIVITY OF THE SMALL INTESTINAL MUCOSA IN THE DEPENDENCE OF AGE. *(Ger.)* Richter, V.; Borner, R.; Rotzsch, W. (Div. Medicine, Karl Marx Univ., Leipzig, Germany). *Z. Alternforschr.* 29(1):69-74, 1974.

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7302 PATHOPHYSIOLOGY AND DIETETICS OF SMALL INTESTINAL ANASTOMOSES AND RESECTIONS. *(Fr.)* Tremolieres, J.; Sautier, C. (no affiliation given). *Anesth. Analg. (Paris)* 31(6):909-920, 1974.

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See also, 6990, 6991, 6998, 7013, 7050, 7054, 7069, 7097, 7164, 7174, 7199, 7207, 7275, 7276, 7277, 7351, 7352, 7353, 7354, 7359, 7362, 7371, 7386, 7407, 7449, 7498, 7523, 7529, 7537, 7543, 7557, 7603, 7703, 7764, 7824, 7825, 7845, 7850, 7855, 7864, 7865, 7867, 7870, 7878, 7880, 7889, 7910, 7945, 7974, 7975, 7985, 7990, 7992.

SMALL INTESTINE

Malabsorption

7351 FAILURE OF LABORATORY AND RADIOLOGICAL STUDIES TO PREDICT JEJUNAL MUCOSAL ATROPHY. *(Eng.)* Sanderson, M. C.; Davis, L. R.; Mowat, A. P. (King's Coll. Hosp., London SE5, England). *Arch. Dis. Child.* 50(7):526-531, 1975.

Fifty-eight infants and children in the early stages of malabsorption were investigated using special metabolic facilities. The data obtained were then compared with the results of small intestinal biopsy in order to assess the value of the preliminary investigations. The cases were allocated to one of two groups according to the small intestine histology: group I, normal histology 31 cases; group II, abnormal histology 27 cases. In group II, 22 patients had subtotal villous atrophy and five had partial villous atrophy. Of the 58 patients, 33 were under three yr of age, 25 above. The final diagnoses of those with a normal histology were: emotional deprivation and/or food refusal (seven), constitutional short stature (four), postgastroenteritis (three), recurrent respiratory infections (three), chronic diarrhea (three), giardiasis (two), habitual vomiting (two), normal child (two), inadequate breast feeding (one), iron deficiency with malabsorption (one), neurofibromatosis (one), dermatitis herpetiformis (one), eczema (one). A rise in blood glucose of less than 40 mg/ml was noted in 15 of 22 patients with abnormal mucosal histology. Rises of less than this were seen in more than 50% of those with normal histology. Fecal fat excretion in excess of 4.5 g/day was noted in 10 of 18 with abnormal histology. A xylose excretion of less than 20% was noted in more than 50% in both groups. Barium lactose examination showed a malabsorption pattern, and in some cases hypolactasis as well, in 13 of 16 with abnormal histology. Of 26 cases with normal histology, seven were abnormal on the barium studies, six of which were regarded as borderline. In patients with villous atrophy, 14 of 20 had a bone age more than 10% below the chronological age, while 13 of 29 with normal histology had a reduced bone age. More than half the patients with villous atrophy had a hemoglobin level of less than 11.5 g as against 25% of those with normal histology. Only two of 27 with normal histology had serum albumin levels of less than 3.5 g/100 ml, while nine of 24 with villous atrophy had low levels. Of 14 with villous atrophy, eight had a rise of triglycerides of less than 50 mg/100 ml; eight of 15 with normal histology had similar low rises. The results of these tests indicate that the application of a number of tests to show malabsorption in children suspected of having celiac disease is unrewarding. No investigation other than small intestine biopsy has shown with certainty the patients with mucosal atrophy and possible gluten enteropathy.

7352 INFLUENCE OF MIXTURES OF TAUROCHOLATE, FATTY ACIDS AND MONOLEIN ON THE TOXIC EFFECTS OF DEOXYCHOLATE IN RAT JEJUNUM IN VIVO. *(E.)* Lamabadusuriya, S. P.; Guiraldes, E.; Harries, J. T. (Inst. Child Health, 30 Guilford, London WC1N 1EH, England). *Gastroenterology* 69(2):463-469, 1975.

The influence of mixtures of taurocholate (TC), fatty acids and monolein (MO) on the inhibitory effects of deoxycholate was studied. In closed-loop studies, deoxycholate (DC) at 2.5 mM induced net secretion of H_2O, Na and Cl into the intestinal lumen. TC (20 mM) plus DC caused a reduction in the movement of H_2O and Na, but not of Cl. A mixture of DC, TC and oleic acid (OA) caused a reduction in DC-induced secretion. Similar effects were noted with mixtures of DC and caprylic acid (CA), and/or MO. These effects were only partial and transport values remained different from controls except for Na. OA (10 mM) emulsions and TC (2.5 mM) had no effect on DC-induced secretion and 20 mM of TC had no effect on H_2O, Na or Cl movements. Inhibition of glucose transport by 5 mM of DC was abolished by a DC, TC and OA mixture. When a mixture of DC, TC and OA was perfused, the inhibition effects of DC were markedly reduced, with net secretion being reversed to net absorption. The reduction in transmural potential difference induced by 1 mM of DC was abolished by mixed micelle solutions. Deoxycholate produced significant inactivation of total and (Na-K)-ATPase and this effect was completely abolished by mixed micellar solution. These results indicate that the mechanism of micelle inactivation in DC action may be a reduced access to jejunal membrane and/or a reduction in the relative concentrations of other bile salts and lipids within the intestinal lumen.

7353 ENTEROPATHY IN ADULT PROTEIN MALNUTRITION: LIGHT MICROSCOPIC FINDINGS.

(E.) Duque, E.; Bolanos, O.; Lotero, H.; Mayoral, L. G. (Universidad del Valle Sch. Medicine, Apartado Aereo 1013, Cali, Colombia, South America). *Am. J. Clin. Nutr.* 28(8):901-913, 1975.

Intestinal morphological findings are presented in conjunction with severe, long-standing primary protein malnutrition. A total of 35 patients were studied (21 males and 14 females, aged 16-69 yr). All patients showed low values in all nutritional and absorptive parameters tested except fecal fat and serum vitamin B_{12}. Most showed slight or moderate abnormalities in intestinal mucosal pattern. Villus height decreased, with widening due to edema and inflammation. Total mucosal thickness was not affected. The mean number of mitoses/five crypts was directly proportional to crypt depth and these ratios were larger in several malnourished patients. A thickening of the epithelial basement and perivascular membranes was observed in 24 of 35 cases. A mononuclear infiltration of the lamina propria was present in all patients. Protein repletion acheived amelioration of both the clinical and histologic abnormalities in all but one patient. The two main findings that characterize the state of severe malnutrition are reduction in intestinal mucosal thickness and atrophy of the crypts. The mild enteropathy of severe protein malnutrition must be considered in the differential diagnosis of malabsorption in the tropical setting. It is concluded that adequate classification of the biopsies and careful histometric evaluation is required.

7354 ENTEROPATHY IN ADULT PROTEIN MALNUTRITION: ULTRASTRUCTURAL FINDINGS.

(E.) Duque, E.; Lotero, H.; Bolanos, O.; Mayoral, L. G. (Universidad del Valle Sch. Medicine, Apartado Aereo 1013, Cali, Colombia, South America). *Am. J. Clin. Nutr.* 28(8):914-924, 1975.

The intestinal ultrastructure of severely malnourished adults with primary (dietetic) protein malnutrition is reported. In all nine patients studied (six males, three females), the biopsies showed varying abnormalities of the absorptive cells. These abnormalities included microvilli slightly shortened, small in number and deviating from the vertical position. No correlation was found between the degree of these abnormalities and the severity of the protein malnutrition or malabsorption. In eight of nine cases, in the subepithelial region a dense, finely granular material was noted, accompanied by collagen fibers immediately below the basement layer. In some areas these deposits and collagen appeared to be united, forming a "complex" between the epithelial and capillary membranes. These findings were believed to be nonspecific, but represented a secondary response to chronic inflammation caused by abnormal intestinal bacterial flora.

7355 ANTI-RETICULIN ANTIBODY IN JEJUNAL JUICE IN CELIAC DISEASE.

(E.) Mawhinney, H.; Love, A. H. G. (Dept. Medicine, Queen's Univ. of Belfast, Belfast BT12 6BN, Northern Ireland). *Clin. Exp. Immunol.* 21(3):394-398, 1975.

Analysis was made of samples of jejunal juice from 14 untreated celiac patients (four men and 10 women, aged 14-69 yr), from 12 patients (five men and seven women, aged 14-59 yr) with normal jejunal biopsies, and from 10 normal control subjects (six men and four women, aged 23-35 yr). The results of the investigation showed that it was possible to demonstrate anti-reticulin antibody in jejunal juice. This antibody was demonstrated only in the immunoglobulin A (IgA) class. IgA anti-reticulin antibody was present in eight of 14 (57%) patients with untreated celiac disease, one of 12 (8%) in the normal biopsy group, and in none of the 10 controls. The presence of anti-reticulin antibody in jejunal juice suggests that this antibody arises as a result of stimulation of the secretory immune system. As the various parts of the secretory immune system function independently, the presence of anti-reticulin antibody in jejunal juice must result from antigenic stimulation of the immunocompetent cells of the small intestine. This supports the theory that reticulin behaves as a dietary protein antigen in celiac disease. Anti-reticulin antibody in the present study differs from antibodies to dietary protein antigens, such as gluten and cow milk proteins, in that antibodies to these proteins have been demonstrated in the jejunal juice not only of celiac patients but also of many subjects with normal jejunal biopsies as well as normal control subjects.

7356 THE IMMUNOGLOBULIN CLASS RESPONSES TO ORAL POLIOVACCINE IN COELIAC DISEASE.

(E.) Mawhinney, H.; Love, A. H. G. (Dept. Medicine, Queen's Univ. of Belfast, Belfast BT12 6BN, Northern Ireland). *Clin. Exp. Immunol.* 21(3):399-406, 1975.

By means of an indirect immunofluoresent technique, the incidence and immunoglobulin (Ig) class distribution of the serum antibody response to type II p. o. polio vaccine was studied in 38 patients (22 women and 16 men, aged 15-72 yr) with adult celiac disease and compared with matched control subjects. Of the 38 patients, 19 (50%) showed an antibody response compared with only seven of 38 control subjects (18%). In 16 of the 38 patients (42%) poliovirus-specific IgA responses were noted, compared with 7 of 38 controls (18%). Poliovirus-specific IgG responses were seen in only 10 of 38 patients (26%) and four of 38 controls (11%). No poliovirus-specific IgM responses were observed. There was no evidence of any difference in the magnitude of the poliovirus-specific IgA or IgG responses in the celiac and control group subjects. The preimmunization poliovirus-specific IgA titers of those who showed an antibody response were significantly higher in the celiac than in the control group. The most striking difference between the patients with celiac disease and the control subjects was the much higher incidence of antibody responses to challenge with p.o. poliovaccine in the group of celiac patients. The explanation for this phenomenon is not known at present.

7357 CHYLOUS ASCITES AND INTESTINAL MUSCULAR HYPERTROPHY OCCURRING IN THE COURSE OF CELIAC SPRUE.

(E.) Kaufmann, H. J. (Katonah Med. Group, N.Y.). *Am. J. Dig. Dis.* 20(5):494-497, 1975.

A 57-yr-old male presented with a 6 yr history of episodic abdominal pain, bloating, and diarrhea, with an associated 10 pound weight loss. Four years earlier an oral cholecystogram showed nonfunction, and a cholecystectomy revealed no abnormalities of the abdominal contents except for an inflammed non-calculous gallbladder. Three years later, exploratory laparotomy showed a milky-white fluid in the abdominal cavity which did not show malignant cells, but did show cholesterol crystals on microscopic examination. The entire small intestine was distended and hypertrophied and showed increased peristaltic activity from the ligament of Treitz to the ileocecal valve. On the present admission X-rays of the gastrointestinal tract with barium showed a dilated but normal colon and a diffusely abnormal small intestine, with dilatation and thickening of the valvulae conniventes. A biopsy of the proximal jejunum with a Crosbly capsule showed a virtually flat mucosa, marked inflammation of the lamina propria, and cuboidal epithelial cells. Treatment with a gluten-free diet brought about improvement in his symptoms. A few months later, tetracycline, 1 g daily, was given due to the presumption that stasis with secondary bacterial overgrowth was present, causing some repeated attacks. Six months later, suspecting an ulcerated area of bowel or a tumor might be causing his bouts of apparent obstruction, a second laparotomy was performed. The proximal half of the small intestine was markedly thickened and dilated. The distal half of the small intestine was almost normal. The colon was dilated. Two large mesenteric nodes were present, the larger of which was microscopically normal. The most striking feature was the great thickening of the muscular layers, which measured 4 mm in the fixed state. The mucosa was consistent with treated celiac sprue. The use of tetracycline was gradually discontinued and the only episodes of pseudoobstruction which now occur seem to follow inadvertent ingestion of gluten. This patient showed the development of chylous ascites in the course of celiac sprue and disappeared on treatment. Its presence was probably related to the mesenteric nodal hyperplasia which is known to occur in celiac sprue.

7358 THE IMMUNE RESPONSE TO ϕX 174 IN MAN. III. EVIDENCE FOR AN ASSOCIATION BETWEEN HYPOSPLENISM AND IMMUNODEFICIENCY IN PATIENTS WITH COELIAC DISEASE.

(E.) Baker, P. G.; Jones, J. V.; Peacock, D. B.; Read, A. E. (Univ. Bristol, Dept. Medicine, Bristol BS10 5NB, England). *Gut* 16(7): 538-542, 1975.

The coliphage ϕX 174 was used to study antibody production in coeliac disease. In all eight cases studied the diagnosis was based on histological changes of subtotal villous atrophy in the jejunal biopsy. Three cases showed a gross impairment of the primary response with a peak antibody level of less than 20. There were no significant changes in the other five cases as to appearance of antibody, rate of titer increase, height and time of peak response or rate of antibody decline. There was considerable impairment in the secondary response. There was a correlation between the severity of the disease and the depression of antibody production. Spleen size was below normal in five of the cases. Serum IgM levels in three cases were abnormally high. It was concluded that patients with coeliac disease have a depressed ability for antibody production with a defect in switching from IgM to IgG antibody.

7359 CHRONIC CELIAC DISEASE COMPLICATED BY A PRIMARY RETICULUM CELL SARCOMA OF THE SMALL INTESTINE.

(Fr.) Rutsaert, J.; Mainguet, P.; Bleiberg, H. (Faculte Medecine Pharmacie, 97, rue aux Laines, Bruxelles, Belgique). *Ann. Anat. Pathol. (Paris)* 19(3):299-310, 1974.

A 33-yr-old patient with celiac disease was the basis of this study. The onset of the illness was in infancy; no specific treatment was recommended during childhood. At 21 yr a gluten-free diet was prescribed. At the age of 31, abdominal pains, diarrhea and x-ray confirmation led to the diagnosis of duodenal stasis which called for exploratory laparotomy. No tumor was found and a duodenojejunostomy was performed. At 32 yr, diarrhea, fever and an inflammatory state were observed. A jejunal biopsy showed severe atrophy of the villi, a month after which an acute abdominal syndrome ensued. Numerous perforated tumors of the jejunum identified as reticulum cell sarcoma and an ileo-cutaneous fistula were discovered. At the age of 33 the patient died in a state of advanced cachexia. A tumoral mass adherent to the spleen, the stomach and the colon was autopsied from the left hypochondrium. A second stomach perforation was discovered, as well as generalized hepatic angiomatosis, and arterial and renal calcifications. Hypotheses were advanced as to the cause of the sarcoma in celiac patients, such as the action of radiation, pre-cancerous state of the atrophic intestinal mucosa, penetration of carcinogenic foods or micro-organisms in an already overstressed mucosa, or possibly an immunologic deficiency. There exists a very probable link between celiac disease and intestinal sarcoma, the pathogenesis of which is still unknown.

7360 ENTEROTOXIGENIC INTESTINAL BACTERIA IN TROPICAL SPRUE. III. PRELIMINARY CHARACTERIZATION OF Klebsiella pneumoniae ENTEROTOXIN.

(E.) Klipstein, F. A.; Engert, R. F. (Univ. Rochester Medical Center, 601 Elmwood Ave., Rochester, N.Y.). *J. Infect. Dis.* 132(2):200-203, 1975.

The enterotoxin secreted by a strain of *Klebsiella pneumoniae* serotype 5, which was the predominant organism cultured from the midjejunal aspirate of a Puerto Rican with tropical sprue, was characterized. Cell-free broth filtrates were prepared by stationary aerobic incubation of cultures in trypticase soy broth. The crude filtrates were freeze-dried, after which portions were heated (100 C for 30 min), treated with acid (pH 4.4), dialyzed through viscose tubing, or subjected to acetone precipitation followed by sequential passage through Diaflo membranes. The various preparations were tested in the ileal loops of 8 to 12-week-old coccidia-free rabbits. The cell-free filtrates retained their capacity to induce fluid secretion in the rabbit ileal loops after heating, acid treatment and dialysis. The acetone precipitate also produced a positive response, which was increased in the ultrafiltration membrane (UM) 2 retentate; the UM 2 filtrate was comparatively less active in this respect, and the UM 10 retentate was inactive. Increasing purification of the *K. pneumoniae* broth filtrate material was associated with a progressive fall in the osmolality of the active fractions. The UM 2 retentate produced a positive fluid response in the ileal loop model when dissolved in isotonic solution. The data indicate that the enterotoxin elaborated by *K. pneumoniae* resembles the previously characterized heat-stable enterotoxin of *E. coli* in a number of respects.

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7362 THE PATHOPHYSIOLOGICAL ROLE OF THE SMALL INTESTINAL BACTERIAL FLORA IN THE "STAGNANT LOOP SYNDROME". *(Ger.)* Hoffgen, K. U.; Wirth, K. (Zentrum fur Innere Medizin der Jostus-Liebig Universitat Giessen, Germany). *Med. Klin.* 70(17): 760-765, 1975.

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7367 SPECIAL INQUIRY INTO VITAMIN METABOLISM IN MALABSORPTION SYNDROME. *(Ger.)* Castrillon-Oberndorfer, W. L. (Medical Clinic, Univ. Tubingen, Germany). *Therapiewoche* 25(12):1424-1430, 1975.

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7369 PHYSIOPATHOLOGY OF INTESTINAL ABSORPTION. *(Sp.)* Bueno Gomez, J. (no affiliation given). *Rev. Esp. Enferm. Apar. Dig.* 45(5):586-590, 1975.

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7379 WHIPPLE'S DISEASE. REPORT OF A CASE CHARACTERIZED BY RECURRENT LEFT-SIDED PLEURAL EXUDATE. *(Dan.)* Andersen, C. W. (Amtssygehuset, Astersvej 31, 2, DK-4600 Koge, Denmark). *Ugeskr. Laeger* 137(5):264-267, 1975.

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7386 THE PATHOPHYSIOLOGICAL ROLE OF THE SMALL INTESTINAL BACTERIAL FLORA IN THE "STAGNANT LOOP SYNDROME." *(Ger.)* Hoffgen, K. U.; Wirth, K. (Zentrum fur Innere Medizin, Justus-Liebig-Universitat, Giessen, Germany). *Med. Klin.* 70(17):760-765, 1975.

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7391 STEATORRHEA: PATHOPHYSIOLOGICAL, DIAGNOSTIC, AND THERAPEUTIC ASPECTS WITH CONSIDERATION OF RECENT FINDINGS ON BILE ACID METABOLISM. *(Ger.)* Schentke, K. U. (Medizinische Akademie "Carl Gustav Carus," 8019 Dresden, Fetscherstrasse 74, Germany). *Z. Aerztl. Fortbild.* 69(5):225-229, 1975.

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See also, 6656, 7010, 7326, 7328, 7334, 7335, 7338, 7501, 7703, 7852, 7853, 7854, 7873, 7880.

LARGE INTESTINE

7394 WHAT DO WE GAIN FROM THE SIXTH STOOL GUAIAC? *(E.)* Neuhauser, D.; Lewicki, A. M. (Harvard Sch. Publ. Health, Boston, Mass.). *N. Engl. J. Med.* 293(5):226-228, 1975.

The marginal cost involved in implementing the six sequential stool guaiac protocol of Greegor for screening of colonic cancer was analyzed. The expected yield of true-positive results from six se-

ential guaiac tests was calculated for a popula-
on of 10,000 people of whom 72 were assumed to have
lonic cancer. A two guaiac protocol would have a
ue positive rate of 99.31% and a false positive
te of 59.69%. There was little gain in the true
sitive rate from testing beyond the second guaiac
amination, but there was a steadily rising rate in
e false positive group with more frequent testing.
alysis of the expenditures involved in such a pro-
am showed that the cost of detecting cancer rose
ponentially so that the marginal cost of the sixth
st may be 20,000 times the average cost. The mar-
nal cost was decreased with lower test sensitivity
d increased with lower prevalence of colonic can-
r. The results show how an inexpensive test can
come quite expensive if it is to be made available
a larger population group. This high cost is in-
rred with only a small gain in terms of additional
ncer found by the last few guaiac tests of this
ogram. Intuitively, it may then seem more profit-
le to proceed immediately to the barium enema ex-
ination, a completely accurate, if more expensive,
ocedure that needs to be done only once. The mar-
nal cost/case detected depends on the prevalence
the condition in the population screened and the
nsitivity of the test applied.

95 FACTORS AFFECTING THE CONCENTRATION OF COMBUSTIBLE GASES IN THE COLON DURING

LONOSCOPY. *(E.)* Bond, J. H., Jr.; Levitt, M. D.
eterans Admin. Hosp., Minneapolis, Minn. 55417).
stroenterology 68(6):1445-1448, 1975.

e concentrations of H_2 and CH_4 in colonic gas ob-
ined through the colonoscope at the time of colono-
opy were measured in 60 consecutive patients, and
e effects of liquid diet, fasting, and bowel cleans-
g on the rate of production of those colonic gases
re assessed. The colonic concentrations of H_2 and
were well below hazardous levels in all patients
the time of colonoscopy. The mean concentration
H_2 was 0.024% ± 0.007% and of CH_4 was 0.0023% ±
001%. The highest concentration of either gas en-
ntered was only about 1/20 of the minimal explosive
ncentration. These low values could be the result
the colonoscopy preparation procedure and/or dilu-
on with air introduced during colonoscopy. The
ient preparation procedure was analyzed by measur-
g excretion of H_2 and CH_4 in 10 subjects undergoing
tine colonoscopy preparation, in five subjects in-
sting the low residue liquid diet for 48 hr, in 10
unteers who fasted for 12 hr, and in two volun-
ers undergoing the colonic cleansing procedure used
colonoscopy. Hydrogen excretion fell precipi-
sly to about 10% of basal values after 24 hr on
iquid diet and showed a further decline to 5% of
preparation level at the time of colonoscopy.
contrast, CH_4 fell to about 60% of basal levels
day one; however, just prior to colonoscopy, CH_4
retion had declined to only about 15% of the basal
el. In patients on a low-residue liquid diet, H_2
retion rapidly fell to low levels; however, CH_4
retion was minimally reduced. Fasting resulted
a 15-fold reduction in H_2 excretion, but only a
fall in CH_4. Bowel cleansing reduced both H_2
CH_4 10-fold. The results do not support the need for routine CO_2 insufflation prior to colonoscopic electrosurgical polypectomy.

7396 PROBABILISTIC APPLICATION OF PLASMA CARCINOEMBRYONIC ANTIGEN ASSAY IN CANCER PATIENTS.

(E.) Ashman, L. K.; Ludbrook, J.; Marshall, V. R. (Dep. Surg., Univ. Adelaide, Adelaide 5000, South Australia). *Br. Med. J.* 2(5973):721-724, 1975.

In an attempt to establish a more appropriate control group, carcinoembryonic antigen (CEA) levels were determined in patients proved after death to be cancer-free, as the basis against which to compare levels in cancer patients. Plasma samples were assayed for CEA activity in 114 subjects, including 21 healthy volunteers, mean age 24.1 yr, male:female ratio, 1.1:1; 23 patients without cancer, mean age 59.5 yr, male:female ratio, 2.8:1; and 64 cancer patients, mean age 68.4 yr, male:female ratio, 2.2:1. Tumors in this group originated in the lung (22), colon (14), rectum (10), prostate (seven), pancreas (six) and stomach (five). Two radioassay procedures were used: the Roche assay and an assay developed in this laboratory. The mean plasma CEA concentrations in healthy controls by the first technique was 2.42 μg/ml, and by the second, 6.30 μg/ml, and neither group differed significantly from normal. Patient controls had a significantly greater mean CEA level than healthy controls by both procedures. Of 64 cancer patients, 19 by the second assay and 18 by the first assay had plasma CEA levels above the upper 90% confidence limit. When compared with healthy controls, 50 were in this range. Of 19 patients with plasma CEA levels corresponding to a better than 95% probability of cancer, three had disease confined to the organ of origin, four had lymph node involvement and 12 had distant metastases. These data indicate that CEA results should be expressed in probabilistic terms, rather than with the use of a simple cutoff.

7397 COMPARATIVE ELECTRON MICROSCOPIC FEATURES OF NORMAL, HYPERPLASTIC, AND ADENOMATOUS HUMAN COLONIC EPITHELIUM. II. VARIATIONS IN SURFACE ARCHITECTURE FOUND BY SCANNING ELECTRON MICROSCOPY.

(E.) Fenoglio, C. M.; Richart, R. M.; Kaye, G. I. (Coll. Physicians Surgeons, Columbia Univ., New York, N.Y.). *Gastroenterology* 69(1):100-109, 1975.

The architecture and surface cytoplasmic features of the mucosa of normal colon, hyperplastic polyps, and colonic adenomas were studied by scanning electron microscopy. Thirteen hyperplastic polyps and 15 adenomas were taken from patients, along with adjacent normal colonic mucosa. Specimens were fixed in glutaraldehyde and coated with gold-palladium. After scanning, they were reprocessed and stained for light microscopy. Scanning electron microscopy showed the surface architecture of normal colonic mucosa to be arranged in interconnecting territories containing 20-100 crypt mouths each, in parallel linear arrays, separated by deep clefts. Areas were covered by mucinous secretions from the crypt mouths. The hyperplastic polyps were heavily coated with mucinous secretion. In the transition zone to normal mucosa, a similar territorial configuration but in an exagerrated form was seen. Thick cord-like elevations of the surface tapered into a flattened zone which appeared to have lost its normal architecture due to stretching. Nonvillous adenomas had anastomosing cerebriform epithelial cords surrounding deep epithelial depressions that were too wide to be crypt mouths. No normal crypts were identified. When the adenomas were pedunculated, the stalks were normal mucosa. Villous adenomas had more prominent convoluted cerebriform anastomosing ridges separated by deep clefts. In cell arrangement and cytological features, the normal mucosa was coated with an irregular lining of absorptive epithelium with occasional dispersed goblet cells. The lining cells of the crypt appeared to be arranged in overlapping spirals or rings. The tops of the absorptive cells appeared as pentagons covered with closely packed microvilli, while some cells protruded from the surface and had taller, more widely spaced microvilli. There were all gradations between the two types. The microvilli had clubbed tips, possibly an artifact. In the hyperplastic polyps, the polygonal tops of the absorptive cells were stretched into elliptical shapes, especially on the lateral polyp surfaces. Goblet cells were absent at the free surfaces, and absorptive cell microvilli were twice normal size. The polypoid and villous adenomas had nearly total absence of surface goblet cells, but hypersecretory villous adenomas had greater than normal numbers of them. Most adenoma cells were smaller than normal, and departed from the normal polygonal shape. There were occasional large surface cells. Most absorptive cells had short, blunt microvilli, but in some they were elongated fanned tufts. It is concluded that there are divergent patterns of surface morphology in hyperplastic and adenomatous mucosa.

7398 INVESTIGATIVE MEASURES IN DIVERTICULAR DISEASE: RADIOLOGY COLONOSCOPY. *(E.)*

Samuel, E.; Dean, A. C. B. (no affiliation given). *Clin. Gastroenterol.* 4(1):71-84, 1975.

Investigative procedures to demonstrate presence of diverticular disease and to exclude other colonic disease are discussed. In radiological diagnosis, barium enema is the keystone. The diverticula often fail to fill when the barium is administered by mouth. The colon should be cleansed thoroughly, followed by an enema of 1:4 barium sulfate solution after one hr. Injection of air after evacuation is not recommended. The filled diverticulum appears as a flask-shaped projection from the lumen. A spiculated outline of the colon indicates overactivity and thickening of the musculature. Complicating inflammatory change in the diverticular area can only be made with certainty when peri- or paracolic abscess formation or fistulae into another viscus is present. When barium studies have shown some dubiety, such as a narrow irregular segment associated with the diverticula, then colonoscopy is indicated. As with radiology, this should not be carried out until about six weeks after an acute attack of diverticulitis. Regular 10 ml doses of $MgSO_4$ should be given three times daily for 48 hr prior to examination to facilitate cleansing. At sharp bends with narrow lumens, the instrument may be pushed forward, rotating to and fro in a zig-zag fashion, even when out of direct vision. The uninflamed diverticulum appears as an oval porthole lying in normal mucosa, revealing a shadowy cavern beyond. When inflammation is present, it may appear only as a small pit or depression in the swollen mucosa. Differential diagnosis of carcinoma by radiology is difficult when a scirrhous carcinoma distorted by diverticula is present, and must be distinguished from muscular hypertrophy, inflammatory stricture, and pericolic abscesses. With colonoscopy, there is a high failure rate because the instrument may not pass through the narrowed portion. Transintestinal intubation provides a possible solution. Colonoscopy and frozen section biopsy can be performed during laparotomy. Differential diagnosis of Crohn's disease is a less common problem. Symptoms of diarrhea, rectal bleeding and perianal abscess or fistula are suggestive of Crohn's disease. Biopsy and colonoscopy may be helpful. Perforation with peritonitis is the commonest complication of diverticular disease, followed by localized paracolic abscesses and fistulae to the bladder, or the vagina, small bowel, or anterior abdominal wall. Hemorrhage occurs rather uncommonly and usually responds to conservative treatment. Etiology of the disease through radiological and pressure studies is believed to stem from spasm or hypertrophy of the circular muscle, or its crowding by contraction of the longitudinal muscle.

7399 DIVERTICULAR DISEASE OF THE COLON, A 20TH CENTURY PROBLEM. *(E.)*

Painter, N. S.; Burkitt, D. P. (no affiliation given). *Clin. Gastroenterol.* 4(1):3-21, 1975.

The history of colonic diverticular disease, its geographical prevalence, and a hypothesis of its etiology is presented. The disease was not recognized as a clinical problem until about 1900 and surgical cure not practiced until 1942. In the early 1960s the pathology of the disease was linked to high intracolonic pressures. Parenteral morphine injections were found to cause diverticulum-bearing segments of the sigmoid to produce greater pressures (sometimes over 90 mm Hg) than normal segments in the same patient. Cineradiography showed high localized pressures were produced by segmentation of the colon, regardless of the type of stimulus. Prediverticular colons produced higher pressures than normal ones, indicating a primary inward disturbance of motility that resulted in diverticular formation secondarily. A close relationship was found between incidence of the disease and economic development of the geographical area. The disease is almost unknown in Africa, very rare in India and the Middle East, Singapore, Malaysia, Korea, Bangkok, and southern Spain. The diet in these countries contains more fiber than the refined foods of industrialized countries where the disease commonly occurs. The American negro has become increasingly prone to the disease as increasing prosperity has led to his eating less maize, and the high incidence of the disease in Japanese born and bred in Hawaii compared with those living in Japan is accompanied by similar dietary changes. It is hypothesized that a diet containing adequate fiber will pass through the gut in 48 hr (1/2 the time of a refined diet). The gut therefore has less time to absorb water, the fecal stream is not as viscous and the colon need not build up as much pressure as for the viscous low fiber diet. Patients with symptomatic diverticular disease were given a high fiber diet containing miller's bran and reduced sugar. Abdominal pain and distension were relieved in over 85% of the 70 patients. Those who defecated once a week with effort passed soft stools every day. It is concluded that diverticular disease is due to fiber deficiency in the diet.

7400 NATURAL HISTORY OF DIVERTICULAR DISEASE OF THE COLON. *(E.)* Parks, T. G. (no affilation given). *Clin. Gastroenterol.* 4(1):53-69, 1975.

The course and prognosis of symptomatic diverticular disease is reviewed. The incidence increases with age, rising from 5% in the fifth decade to about 50% in the ninth. In one study, 7.7% of patients with the disease were in their ninth decade before presenting with symptoms. Mortality and morbidity are higher in older persons; in one study 20% of all patients in their sixth decade had radiological evidence of diverticulitis compared with 33% of the patients in their ninth. Several surveys found 1.7%, 4.8%, and 2.3% of patients under 40 yr of age. In younger persons it is often aggressive, associated with more troublesome symptoms, and a high complication rate. Studies early in the century showed a preponderance of males (1.6:1 to 3:1) but in the past 30 yr there has been a female preponderance or no differential. Generally, patients with many diverticula were older than those with few. However, the disease does not necessarily progress with age. Many patients also had no increase in diverticular size in 10 yr. There is little evidence that probability of recurrence of diverticulitis and incidence of complications are directly proportional to the number of diverticula. In over 90% of all patients, the sigmoid is the segment affected, and in 45-65%, it is the only segment affected. It has been shown that over 2/3 of the patients are not condemned to relentless advance of the disease; resection is often curative. Patients with extensive or total involvement are no older on the average than those with the disease localized to the sigmoid. Prognosis is related to pathological development in the distal left colon, but not to the more proximal disease. In one study, over 90% of diverticulitis operations involved the sigmoid. Incidence of diverticulitis or peridiverticulitis can be accurately assessed, but has been estimated at 10-20% of patients with diverticula. In one series, 50% of the patients had no symptoms until less than one month prior to referral, and 75% had symptoms less than one yr. Another survey showed 75% of all deaths from the disease occurred in patients who had symptoms less than one month. Of 294 patients, over 50% had symptoms over one yr. Another study showed 45% with symptoms less than one yr and 83% less than five yr. Correlation between symptoms and pathological findings was generally poor. Prognosis was related to symptoms, localized pain giving a better prognosis than generalized pain. Abdominal pain was the commonest symptom in cases requiring hospitalization. Disturbance of bowel habit, nausea and vomiting, distention, and a palpable mass were associated with poorer prognosis. About 40-45% develop recurrent attacks. A high residue diet was effective in treating 80% of 62 patients. In a study of those given resections, 95.6% remained cured (follow-up from 1-16 yr). Proximal colostomy is of limited value in the long term. Closure of colostomy without resection has a high failure rate. Mortality during first hospital stay is about 3%, but may be over 10% when complications are present.

7401 PATHOLOGY OF DIVERTICULAR DISEASE OF THE COLON. *(E.)* Morson, B. C. (no affiliation given). *Clin. Gastroenterol.* 4(1):37-52, 1975.

Diverticular disease occurs in about one of every three people over 60 yr of age in Europe, North America, and Australia. The diverticula consist of a pouch of mucous membrane projecting through the circular muscle layers into the pericolic fat and appendices epiploicae. They include the muscularis mucosae and remain covered by the investing layer of longitudinal muscle. The majority occur at weak points in the circular muscular layer where the main blood vessels penetrate. They are usually confined to the sigmoid, but sometimes spread from there to more proximal locations. The rectum is never involved. Diverticulosis of the right colon only is a separate condition with a high incidence in Hawaii, and may have a different etiology. Isolated diverticula of the right colon are also unrelated to the common forms of the disease, and may be congenital or due to pulsion from high intraluminal pressures. The most consistant feature of diverticular disease of the sigmoid is the muscular abnormality resulting in thick, cartilagenous-like taeniae coli, and corrugated or concertina-like circular muscle. Often the lumen of the bowel is filled with redundant folds of mucous membrane, possibly due to muscular action or pericolic fibrosis. Histologically, the muscle shows thickening, but no hyperplasia or hypertrophy of the muscle cells. Diverticulitis usually begins at the apex of the diverticulum and commonly involves the pericolic and mesenteric fat. Inflammation usually results from abrasion of the mucosa by a fecolith, and rarely occurs in over three or four diverticula in a patient. Pericolic abscesses of diverticulitis are composed of pus and necrotic tissue, are usually chronic in character, and become walled off by fibrous tissue. Crohn's disease may coexist with diverticular disease, and results in an accompanying proctitis or anal lesion. Pathologically, the mucous membrane will be granular or ulcerated, rather than normal as in uncomplicated diverticular disease. Granulomas may be confused with foreign body giant cell reaction to fecal material in pericolic abscesses. Ulcerative colitis, polyps and cancer may also coexist with diverticular disease and should be watched for. Evidence suggests that diverticular disease is due to abnormal increase in the tone of the longitudinal muscle, particularly the taenia coli, which shorten the bowel. Diverticula probably form by pulsion at the weakest point in the wall.

7402 THE TREATMENT AND POSTOPERATIVE COMPLICATIONS OF CONGENITAL MEGACOLON: A 25 YEAR FOLLOWUP. *(Eng.)* Swenson, O.; Sherman, J. O.; Fisher, J. H.; Cohen, E. (Miami Univ. Sch. Medicine, Miami, Fla.). *Ann. Surg.* 182(3):266-273, 1975.

The postoperative complications and long-term follow-up in 483 patients treated by abdominoperineal resection for congenital megacolon are reported. Thirteen pediatric surgeons were contributors to this series. The surgery was performed in a single stage with no preoperative or postoperative ileostomy or colostomy, in two stages with a preoperative ileostomy or colostomy and a takedown of the ostomy at the time of resection, or in three stages, involving a preoperative ostomy, resection, and closure of the ostomy. The patient ages ranged from less than 1 mo to 50 yr, with a mean age of 4.9 yr. There were 16 postoperative deaths (3.3%) and six late deaths (1.2%) from enterocolitis. Immediate postoperative complications included: positive urine cultures in 7.7% of the patients, a wound infection rate of 4.6% (primarily attributable to wound contamination from a preoperative colostomy or ileostomy), dehiscence of the wound in six patients, leak of the coloperineal anastomosis in 24 patients, positive blood cultures in 14 patients, 14 pelvic abscesses, eight intra-abdominal abscesses, and postoperative bowel obstruction requiring laparotomy in 13 cases. Anastomotic leak was unrelated to age at resection or presence of colostomy or ileostomy, but it was significantly increased in patients with Down's syndrome and was most frequent in patients with aganglionosis limited to the rectum. Anastomotic leak significantly increased the incidence of other serious complications. Late postoperative complications included rectal stricture in 30 patients, only seven of whom required a second operation, temporary late soiling in 54 patients, and permanent soiling in 10 patients. Late soiling was significantly more frequent in patients with aganglionosis limited to the rectum than in patients with any other length of aganglionic bowel. There were no patient claims of urinary incontinence or impotence. The low incidence of postoperative complications and the minimal frequency of long-term complications indicate that the abdominoperineal resection is a safe, effective method for the treatment of congenital megacolon.

7403 MELANOSIS COLI: STUDIES OF THE TOXIC EFFECTS OF IRRITANT PURGATIVES. *(E.)*

Steer, H. W.; Colin-Jones, D. G. (Southampton Univ. Medical Sch., England). *J. Pathol.* 115(4):199-206, 1975.

The toxic effects of irritant purgatives were investigated ultrastructurally and histochemically in colonic biopsies from six patients with normal colon and seven patients with melanosis coli. Sections of biopsy tissue were subjected to one of several staining procedures for identification of cytoplasmic organelles. Anthraquinone purgatives increased the number of macrophages in connective tissue of the colonic mucosa. Macrophages near the luminal surface showed more intense acid phosphatase and nonspecific esterase activity than those further away, but no β-glucuronidase activity. Most of the pigment was in the macrophages with less intense acid phosphatase activity; the pigment was positive to Nile blue sulfate method and Schmorl's method indicating the presence of lipofuscin. The purgative also caused an increase in the number of lysosomes in macrophages, Schwann cells, and neurones of the submucosal plexes of the colonic mucosa. An association between lipofuscin and lysosomal particles was confirmed by the finding of acid hydrolases and lipofuscin in macrophages, ganglion cells, and Schwann cells. It is concluded that the effect of anthraquinone cathartics in producing pigmentation is the result of a common cytological response, involving the lysosomes, by different tissues. The pathological effects of these drugs result from their influence on lysosomes in macrophages and nervous tissue.

7404 SURGICAL TREATMENT OF HEREDITARY ADENOMATOSIS OF THE COLON AND RECTUM IN SWEDEN DURING THE LAST 20 YEARS. PART I. INTRODUCTION. SURGICAL PROCEDURES USED. PRE- AND POSTOPERATIVE MEASURES. ARRANGEMENT OF FOLLOW-UP. PROPOSITI GROUP, PRIMARY AND LATE RESULTS. *(E.)*

Alm, T. (St. Erik's Hosp., Stockholm, Sweden). *Acta Chir. Scand.* 141(3):218-227, 1975.

The prevalence of hereditary adenomatosis of the colon and rectum was surveyed in Sweden since 1959. Up to the end of 1972, 97 families were traced and 80 of them were more fully investigated. In 56 of the latter families there were at least two affected members; in the other 24, only one. In all, 340 affected individuals were found, 150 of whom were operated on with the aim of cure. Of these, 82 had presented with symptoms (the propositi group), while 68 affected individuals were detected during the family investigations and underwent prophylactic operations (the call-up group). A comparison was made between the two groups of the primary and long-term results after surgery. Major surgery with total protocolectomy and ileostomy or colectomy with ileorectal anastomosis was performed in 67 propositi and 68 call-up patients; minor surgery with segmental resection was performed in 15 propositi. In the propositi group there were three surgical deaths. At the time of operation 48 patients had already developed cancer. Up to the end of the observation period, 16 had died from metastases, two of other malignancies, and three of nonmalignant disease. In the call-up group, there were three surgical deaths and two late deaths from metastases and other malignancy.

7405 SURGICAL TREATMENT OF HEREDITARY ADENOMATOSIS OF THE COLON AND RECTUM IN SWEDEN DURING THE LAST 20 YEARS. PART II. PATIENTS WITH PROPHYLACTIC OPERATIONS, PRIMARY AND LATE RESULTS. DISCUSSION AND SUMMARY. *(E.)*

Alm, T. (St. Erik's Hosp., Stockholm, Sweden). *Acta Chir. Scand.* 141(3):228-237, 1975.

The surgical treatment of patients with hereditary adenomatosis of the colon and rectum is described as part of an investigation, started in 1959, of Swedish families. There were 68 affected, but symptom-free, individuals detected and referred for surgical treatment. Total proctocolectomy and ileostomy were performed in ten cases, colectomy with ileorectal anastomosis in 58. The surgical mortality was 4.4%. Six patients had cancer at the time of operation, and two other patients were operated on for colonic cancer many years prior to the diagnosis of adenomatosis of the colon and rectum. One of those eight patients died from metastases. Primary malignant kidney tumor was responsible for the only additional late death in this group. In another group of patients operated on because of symptoms, cancer was found in 48 patients, 16 of whom died from metastases. Families in which the disease runs should be placed under continuous supervision. To make this practicable on a large scale, a well functioning central register is necessary. Children of an affected parent should be called for examination at regular intervals over an indefinite period, or at least up to the age of 40. Whenever the disease is diagnosed, the patient should be referred to surgery as soon as is convenient. In the vast majority of cases ileorectal anastomosis is the operative procedure of choice.

7406 IMMUNOTHERAPY OF EXPERIMENTAL COLON CANCER: IMMUNOLOGIC ENHANCEMENT OF GRAFTED TUMOR.

(Fr.) Martin, M. S.; Martin, F.; Lagneau, A.; Horiot, J. C.; Chomono, R. (Laboratoire de Medecine Experimentale et d'Immunologie, et centre G. F. Leclerc, Faculte de Medecine, boulevard Jeanne d'Arc, F 21033 Dijon, France). *Biol. Gastroenterol. (Paris)* 7(4): 249-252, 1974.

Two techniques of immunization were used in this study of 42 BD-IX strain rats (21 test animals and 21 controls). Immunization was induced by six s.c. grafts of a DHB line syngeneic colon carcinoma sterilized by irradiation. The control animals underwent a "test" operation to standardize surgical procedures. Immunization was continued by two injections of 10^6 live cells obtained from trypsinization of DHB treated by mitomycin and neuraminidase. Mitomycin is a radiomimetic agent which blocks cellular multiplication and neuraminidase probably unveils immunological sites masked by sialic acid. Three weeks after the last "immunizing" injection, all the remaining animals (18 immunized, 17 controls) were injected s.c. with 10^6 viable untreated cells. The tumor grew in all immunized animals and in ten of 17 control animals, the tumor weighing 3,104 mg and 412 mg, resp. The results indicate reverse immunoprotection of unknown mechanism which leads to enhancement of the tumor. It has been suggested that the cause may be a preponderance of the tumor response (antibody) over the cellular one (lymphocytes). The results call attention to the potential hazards of immunotherapy in human colonic cancer.

7407 SIMULTANEOUS OCCURRENCE OF MULTIPLE GASTRIC CARCINOMAS AND FAMILIAL POLYPOSIS OF THE COLON.

(E.) Ohsato, K.; Watanabe, H.; Itoh, H.; Yao, T.; Nishimura, M. (Kyushu Univ. Faculty Medicine, Fukuoka 812, Japan). *Jpn. J. Surg.* 4(3): 165-174, 1975.

The simultaneous occurrence of multiple gastric carcinomas and familial polyposis of the colon is reported in ten cases. Heredity was confirmed in nine of the ten cases. In eight of the ten cases subjected to detailed study of the upper gastrointestinal tract, polyps and/or carcinomas were detected in the stomach and/or duodenum. Gastric and/or duodenal polyps were found in seven, including one case with concomitant presence of multiple gastric carcinomas. In one case, only carcinomas in the stomach were detected. Histological studies on these polyps revealed all were adenomas except for one case of hamartomatous polyposis. Polyps were not found in small intestine on x-ray examination. All cases except one were treated surgically with single or multiple stage procedures. Total colectomy with or without resection of the rectum was followed by ileorectal anastomosis in six and permanent ileostomy in three. New polyps arising in the preserved rectum after ileoproctostomy were fulgurated or extirpated. There was no surgical death. The presence of numerous adenomas was confirmed in resected and autopsy specimens of the colon and rectum. Adenocarcinomas were present in nine of the ten cases. The rather frequent association of gastroduodenal polyps and cancerous lesions in familial polyposis suggests that such association is a part of the manifestation of this inherited disease. The association indicates that the potential for malignancy occurs not only in the large intestine but in the gastroduodenal mucosa.

7408 CANCER OF THE COLON: SOCIOECONOMIC VARIABLES IN A COMMUNITY.

(E.) Lynch, H. T.; Guirgis, H.; Lynch, J.; Brodkey, F. D.; Magee, H. (Creighton Univ. Sch. Medicine, Omaha, Nebr. 68178). *Am. J. Epidemiol.* 102(2):119-127, 1975.

The relation between socioeconomic factors and the incidence of cancer of the colon was studied in Omaha-Douglas County, Nebraska, (population 345,000) in 1964. Sources of data were medical records from all of the community hospitals and pathology departments, physicians' records and patient interviews. A total of 154 cases of colon cancer were identified in the county in question in 1964 (incidence rate of 44.7/100,000 of population). The median age of the colon cancer probands was 67.2 yr and no significant sex differences were identified. No specific association was observed with any specific occupation and the reported smoking habits did not vary significantly from expectations in this population. Of the 154 cases, 9.7% had one or more first degree relatives with colon cancer and 45.8% had one or more first degree relatives with a history of cancer of any anatomic site. There was a greater frequency of colon cancer in patients living in census tracts with higher average income than in those with lower average income. The opposite was true of esophageal cancer; no familial occurrences of this disease were observed. There was a slight preponderance of affected blacks. Although the survival rate with colon cancer was consistently lower in the lowest socioeconomic group than in the highest socioeconomic group, the difference was minimal. Cancer control implications suggest that screening for colon cancer should be most rigorous among the highest socioeconomic groups.

7409 CARCINOMA OF THE RIGHT COLON.

(E.) Sawhney, K. K.; Kambouris, A. A. (V. A. Hosp., Detroit, Mich.). *Am. Surg.* 41(6):364-369, 1975.

Records of 93 patients with carcinoma of the cecum, appendix, ascending colon, and hepatic flexure were reviewed with respect to primary characteristics and treatment results. The patients ranged in age from 27 to 92; 62.4% were female and 37.6% male. The most frequent symptoms were abdominal pain, weight loss, and weakness. Nausea and vomiting, blood in the stool, and diarrhea were also common. A mass in the right lower quadrant was present in 46%. Intestinal obstruction was present in 12, 75% of which had the tumor in the cecum. Barium enema was performed in 90% and was diagnostic in all but one case. In 50% of the patients, hemoglobin was under 10 g% and in 80% it was under 12.5 g%. Occult blood was in the stools of 50% of 40 patients tested. In 15 cases the tumor was grossly limited within the colonic coats, in 26 it extended to the pericolic fat, in 29 there were metastases to the regional lymph nodes, and in 18 there were metastases to other intraabdominal organs, notably the liver. A right hemicolectomy was performed in 81 (87%). In three the tumor was not resectable and an ileotransverse colostomy was performed. Of four patients with carcinoma of the appendix, three had appendectomy only, and one a delayed right colectomy. In five inoperable patients, chemotherapy was given in four and radiotherapy in one. There were altogether 49 lesions in the cecum, four in the appendix, 41 in the ascending colon, and four in the hepatic flexure. Five patients had multiple lesions, 22 had associated adenomatous polyps, and five had previous intestinal carcinoma. Of the 88 patients given surgery, 13 (14.7%) died within one month: four from peritoneal sepsis, seven from cardiopulmonary causes, one from hypoglycemic shock, and one from cerebral thrombosis. Eighteen patients developed postoperative ileus, 13 wound infections, 4 wound dehiscence, 6 fecal fistulas, and 12 postoperative obstruction. Twelve developed cardiorespiratory complications. Of the 81 right hemicolectomies performed, 64 (79%) were curative, and 17 (21%) palliative. Of the 88 patients operated upon, 40 died during a 5-10 yr follow-up. Of 27 who died during this period, 50% died within 12 months. Overall mortality was 14.7%. Absolute 5-yr survival was 32.2% among all 93 patients. No conclusions are drawn.

7410 ACUTE COMPLICATIONS OF COLO-RECTAL CANCER: SITE, STAGE AND SURVIVAL.

(E.) Fielding, L. P.; Wells, B. W.; Payne, P. M. (St. Mary's Hosp., London, W.2 England). *Clin. Oncol.* 1(2):121-126, 1975.

A series of patients with colorectal cancer was examined to determine whether this disease has a favorable prognosis, and whether patients who present for admission with an emergency differ in terms of age, tumor site, and degree of spread of tumor from those who present for elective treatment. Of 388 patients studied, 155 presented with an emergency. Large intestinal obstruction was the presenting feature in 90; peritonitis was present in 28; diarrhea, abdominal pain and rectal bleeding were seen in 16; and the remaining 21 presented with other emergencies. Only two of 59 patients who did not undergo surgery survived more than 1 yr, and all died by 2 yr. Laparotomy with or without a drainage procedure was carried out in 82 patients: 19 survived 1 yr and seven survived 2 yr. If distant metastases were present at the time of surgery (99 cases) the chances of survival for 1 yr were one in three, and only three patients survived longer than 3 yr. Patients who were emergency admissions and had their tumors resected had a significantly shorted survival time after 3 yr than those receiving elective resection ($P < 0.02$). There was no difference between the groups in the incidence of lymph node or hepatic involvement. The proportion of Dukes' B tumors in the emergency group was greater than that in the elective group (39 and 29%, resp.). The difference in resection rates between the groups was large: 44 and 72% for the emergency and elective groups, resp. The poorer survival figures in the emergency group may partly result from the greater extent of spread of the primary tumor or possibly from the delay associated with a staged resection.

7411 EPIDERMOID CYSTS, POLYPOSIS COLI AND GARDNER'S SYNDROME.

(E.) Leppard, B.; Bussey, H. J. R. (St. John's Hosp. for Diseases of the Skin, London, WC2H, 7BJ, England). *Br. J. Surg.* 62(5):387-393, 1975.

The nature, incidence, and mode of inheritance of the skin cysts of Gardner's syndrome were investigated in 196 members of 15 families with Gardner's syndrome as part of a large survey of benign familial skin tumors. Sixty patients were interviewed either at the hospital or at home. Information from hospital notes was available on 82 patients, 25 replied to letters, and information on 29 was obtained from other members of their families. Cysts of the skin were found in 39 of the 74 patients with polyposis. Microscopical examination of 24 cysts from 15 patients all showed the characteristic features of epidermoid cysts. No examples of pilar cysts or steatocystoma multiplex were found. The number of cysts/patient varied from one to 20, the average was four. In only one patient were they large and disfiguring. The age of onset of the cysts was from birth to 35 yr, with an average of 13 yr. Based on four pedigrees studied, it is concluded that polyposis coli is inherited as an autosomal dominant trait. At present it is not possible to say if Gardner's syndrome is the same as, or different from, familial polyposis. Until all patients with colonic polyps have a full clinical examination for surface tumors, x-rays of the skull and long bones to detect osteomas, and dental x-rays for abnormalities of the teeth, this question will remain unanswered.

7412 EFFECTS OF TWO TYPES OF DIETARY FIBRE IN FAECAL STEROID AND LIPID EXCRETION.

(E.) Walters, R. L.; Baird, I. M.; Davies, P. S.; Hill, M. J.; Southgate, D. A. T.; Green, J.; Morgan, B. (West Middlesex Hosp., Isleworth, Middlesex, England). *Br. Med. J.* 2(5970):536-538, 1975.

The effects of sugar cane residue and wheat bran on stool weight and fecal excretion of acid, neutral steroids and lipids were studied, as well as the effects of sugar cane residue on plasma cholesterol and triglyceride levels, gastrointestinal transit and fecal bacterial flora. Of 19 healthy women in the sugar cane residue group, nine were given a supplement of 10.5 g of the residue in biscuit form and the other ten were given control biscuits low in fiber. Another five subjects were given a supplement of 39 g of wheat bran. The addition of sugar cane residue increased the total dietary fiber by almost 9 g/day in the first group. Stool dry weight in this group was increased by 50% and wet weight by almost 60%. There was an increased daily loss of acid steroids and fatty acids. Elevated excretion of bile and fatty acids did not cause any lowering of plasma cholesterol or triglyceride levels. Gastrointestinal transit time was significantly reduced and there were physicochemical changes in the feces, but the composition of the fecal flora did not change. The average control level of dietary fiber (14 g) was increased to 27 g by the bran supplement. Dilutional effects were observed for both acid and neutral steroids. It is suggested that the different effects of sugar cane residue and wheat bran on steroid excretion are due to differences in their chemical composition.

7413 COLONIC ELECTROLYTE TRANSPORT IN HEALTH AND IN CONGENITAL CHLORIDE DIARRHEA.

(E.) Holmberg, C.; Perheentupa, J.; Launiala, K. (Children's Hosp., Univ. Helsinki, Helsinki, Finland, SF 00290). *J. Clin. Invest.* 56(2):302-310, 1975.

The colonic defect in congenital chloride diarrhea was studied, in addition to normal transport, in three patients with the defect and in their three healthy siblings. Colonic perfusions with $^{36}Cl^-$ were performed. In eight perfusions of the controls, the mean flow of the ileal effluent was 0.9 ml/min and the mean concentrations were: Na^+, 108.3; K^+, 8.8; Cl^-, 67.9; and HCO_3^-, 25.3 mEq/l. In 12 perfusions of the patients, the mean rate was 1.8 ml/min and the mean concentrations were: Na^+, 100.0 mEq/l; K^+, 7.3 mEq/l; Cl^-, 118.0 mEq/l; HCO_3^+, 3.4 mEq/l. There was a marked reduction of Cl^- transport in patients compared to controls. With an extracellular fluid-like perfusate, there was almost no movement of Cl^-. Both influx and efflux were minimal. Reduction of Cl^- concentration in the perfusate caused net secretion of Cl^-. In contrast to controls, absence of HCO_3^- did not alter the Cl^- movement. Absorption of Na^+ was impaired when the luminal contents were acid; net K^+ secretion was increased. These data suggest a defect in the carrier-mediated Cl^-/HCO_3^- exchange mechanism as responsible for the transport impairment in congenital chloride diarrhea.

7414 DISODIUM CROMOGLYCATE IN THE TREATMENT OF CHRONIC PROCTITIS.

(E.) Heatley, R. V.; Calcraft, B. J.; Rhodes, J.; Owen, E.; Evans, B. K. (Univ. Hosp. Wales, Cardiff, Wales). *Gut* 16(7): 559-563, 1975.

A randomized, double-blind, crossover trial was conducted to examine the effect of disodium cromoglycate (DSCG) on chronic proctitis. Twenty-six patients (mean age of 39 years) with chronic proctitis were studied. All active symptoms were present, including: rectal bleeding, mucus passage, decreased frequency of bowel movement and abnormal rectal mucosa on sigmoidoscopy. One hundred mg of DSCG was given p.o. three times/day and 200 mg was self-administered by enema for a period of 4 wk. The three measures of clinical response were: change in sigmoidoscopy, change in bowel frequency and change in blood loss. There was no significant change in the hemoglobin, WBC, ESR or serum IgE levels during the treatment. Patients who responded to DSCG (14 of 26) had significantly more eosinophils in their rectal biopsies than nonrespondents. There was poor correlation between the mucosal inflammatory reaction and changes in the clinical response and sigmoidoscopic appearance. This study provides evidence suggesting that immune mechanisms are important in the pathogenesis of some cases of proctitis and DSCG may play a role in routine patient management.

7415 THE RESPONSE OF THE DOG COLON MUCOSA ONE HOUR'S ISCHAEMIA.

(E.) Robinson, J. W. L.; Menge, H.; Mirkovitch, V. (Hopital Cantonal Universitaire, CH-1011 Lausanne, Suisse). *Res. Exp. Med. (Berl.)* 165(2):127-134, 1975.

The morphology and function of segments of dog colon were studied immediately after or 24 hr after brief ischemia (one hr). Functional analysis of the mucosa consisted of both transport and metabolic studies and included the determination of net sodium transport across the mucosa *in vitro*, the transport capacity *in vitro* for sugars and amino acids, tissue respiration, lactate production and the liberation of acid phosphatase. Immediately after the ischemia, all parameters differed significantly from the control mucosa: net sodium transport was abolished; amino acid and sugar uptake, oxygen consumption and lactate production were reduced; and lysosomal enzyme release was increased. All parameters, except sugar uptake, had normalized 24 hr after the trauma. Histological examinations revealed such variation in the lesions occurring after the ischemia, varying from slight epithelial desquamation to considerable mucosal destruction. In most cases, the mucosa had almost normalized 24 hr later. Morphometric analysis revealed decreased mean mucosal thickness immediately after the trauma, though 24 hr later there was again no significant difference with the control group. The results demonstrate that the colon, like the small intestine, loses most of its functional properties immediately after brief ischemia, but it is able to recover most of its functional integrity within 24 hr of the insult. The extent of the morphological damage of the colon immediately after the ischemia is much more discrete than that occurring in the ileum. This finding indicates that, despite the apparent identity of the functional results, both the sensitivity of the colon to ischemia and its regenerative capacity are less extreme than those of the small intestine.

7416 BACTERIAL STUDIES OF CLINDAMYCIN-ASSOCIATED COLITIS: A PRELIMINARY REPORT.

(E.) Marr, J. J.; Sans, M. D.; Tedesco, F. J. (Washington Univ. Sch. Medicine, St. Louis, Mo. 63110). *Gastroenterology* 69(2):352-358, 1975.

The proctoscopical and bacteriological features of clindamycin-associated colitis were correlated. All patients (16) were taking clindamycin; none were on any other antibiotic. All patients developed diarrhea and underwent proctoscopy; during the procedure fecal specimens were taken and cultured. Biopsies were also taken. In five patients with diarrhea, but not pseudomembranous colitis, fecal cultures showed a variety of anaerobic organisms approximating that in normal intestinal flora. In six patients with pseudomembranous colitis, there was a striking decrease or absence of anaerobic organisms (one anaerobe in three patients and in the other three, no anaerobes). Most had facultative flora, including *Escherichia coli*, *Klebsiella-enterobacter* sp., *Proteus* sp. and enterococci. Five patients with resolving colitis (2-3 weeks after biopsy-proven pseudomembranous colitis had subsided) showed normal numbers of anaerobes. There seemed to be fewer species, but this was not conclusive. All three groups appeared to have the same population of facultative organisms. It is concluded that the disappearance of pseudomembranous colitis is associated with regrowth of anaerobic flora.

7417 CYTOMEGALIC VIRUS INFECTION OF BOWEL IN ADULTS. *(E.)* Dent, D. M.; Duys, P. J.; Bird, A. R.; Birkenstock, W. E. (Groote Schuur Hosp., Capetown, South Africa). *S. Afr. Med. J.* 49(16):669-672, 1975.

Two cases of cytomegalic inclusion virus (CMV) infection of the bowel are presented. A white female with a history of Crohn's disease presented with severe attacks of pain and diarrhea. Barium studies disclosed multiple colox-colic fistulae, which responded to conservative therapy. After six yr she presented with pyrexia, dysentery, weight loss, and painful ulcers of the tongue, mouth, and conjunctivae. A variety of antibiotics, azathioprine (100 mg/day for 2 weeks), and prednisone (80 mg/day for 11 days) failed to help. Laparotomy revealed the entire colon to be thickened with dense adhesions between loops of colon and adjacent ileum. The ileum also appeared abnormal and inflamed. Postoperatively, the patient developed bilateral bronchopneumonia and died. Histologically, the colon showed extensive ulceration with an inflammatory cell infiltrate of lymphocytes, histiocytes, and plasma cells. Throughout the involved areas of the colon were enlarged cells containing eosinophilic intranuclear inclusions surrounded by halos, and extensive bacterial bronchopneumonia. The second case was a black male who presented with watery, offensive stools, vomiting and loss of appetite, weight loss, swelling of the legs and abdomen, and abdominal pain with audible borborygmi. Laparotomy revealed ascites, and the entire length of the bowel was edematous. The terminal 50 cm of the ileum was grossly thickened. This portion was resected, but the patient died postoperatively of bilateral bronchopneumonia. The resected section of ileum showed a cobblestone appearance with pseudopolypi and minute areas of ulceration. The mucosa had heavy infiltration of histiocytes. Large cells with intranuclear inclusions were present in relation to the ulcerated areas and to the capillaries. The first case appears to be Crohn's disease in which CMV was an opportunistic invader. The second case showed a histology unlike tuberculosis, lymphoma, or Crohn's disease, and may represent primary bowel disease caused by CMV. It is concluded that clinicians should be aware of the possibility of CMV disease in patients debilitated by illness and cytotoxic therapy; that preexisting pathology may be modified by CMV invasion; and that diagnosis must be made by culture, or colonic or rectal biopsy.

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See also, 6843, 7019, 7114, 7320, 7325, 7326, 7327, 7340, 7348, 7362, 7386, 7499, 7502, 7505, 7509, 7511, 7520, 7523, 7847, 7848, 7850, 7870, 7882, 7889, 7897, 7901, 7913, 7920, 7934, 7945, 7947, 7962, 7963, 7987, 7991, 7992, 7993.

LARGE INTESTINE

Ulcerative Colitis

7495 PSYCHOSOMATIC STUDY OF PATIENTS WITH TOTAL COLECTOMY FOR ULCERATIVE COLITIS. *(Fr.)* Hachette, J. C.; Bonfils, S.; Boutelier, P. (Service de Gastro-enterologie B et de Chirurgie Hopital Bichat, 170, Blvd. Ney, F. 75877 Paris Cedex 18). *Arch. Fr. Mal. App. Dig.* 63(7):573-580, 1974.

A psychosomatic study of 30 patients after total colectomy for ulcerative colitis was carried out; 17 of them had an ileo-rectal anastomosis (IRA) and 13 others had a definitive ileostomy (I) with proctectomy. The psychosomatic examination was different for each patient in length, timing, and nondirectiveness. Postoperatively, the patients were asked to evaluate: 1) their preoperative understanding of the nature and importance of the surgical intervention (it was clear to the patient 50% of the time), 2) their mood (40% proved nervous), and 3) the quality of the information they received (in retrospect, an IRA patient was always judged to be better informed than an I patient). The postoperative evaluations were that: 1) the psychological state of the patient was very much a function of the frequency of bowel movment (BM) for the I patient, 2) a surprising number of patients reported absolutely no change in their sex life (70%) as a consequence of the surgery (no case of impotence was mentioned), 3) patients with IRA and infrequent BM maintained their prior activities. Ilectomy was accepted less well than IRA, the former being regarded as a mutilation with unconscious reference to castration, but no psychosis ever developed. Nevertheless, such a surgical incervention required not only a psychological and medical preparation of the patient but also adequate acceptance and understanding on the part of the family. These data are not solely to be interpreted as a function of surgical intervention; one must take into account the preexisting psychological make-up of the ulcerative colitis patient.

7496 TISSUE CULTURE OF THE SERA IN HUMAN ULCERATIVE COLITIS. *(E.)* Hardin, C. A.; Werder, A. A. (Univ. Kansas Medical Center, Rainbow Blvd. at 39th, Kansas City, Kans. 66103). *Am. J. Surg.* 130(7):20-22, 1975.

The effects of inoculation of serum (0.1 cc) from either control patients, postcolectomy patients, or those with ulcerative colitis on the growth of human amnion cell cultures were investigated. The sera from 11 control patients had no effect on human amnion cell cultures. Sera from 19 of 21 patients with ulcerative colitis showed a marked cytopathic effect

ith cell destruction. Three of these sera exhibited
cytopathic effect that was passable on three addi-
ional inoculations of human amnion cell cultures.
ne remaining two sera, both from patients with ul-
erative colitis in an inactive state, had no effect.
era of six patients with ulcerative colitis studied
ne yr or longer after total colectomy and proctec-
omy for the disease had no cytopathic effect on
uman amnion cell culture. Rabbits inoculated i.p.
2.0 cc) with these human sera did not develop anti-
odies detectable by the agar diffusion technique,
nd rabbit antisera did not protect against the cy-
opathic effect in cell culture studies. The cyto-
athic effect on cell cultures was not prevented by
irst heating the sera at 70 C for 30 min.

497 COLONIC EPITHELIAL CELLS AND POLYMORPHONUCLEAR LEUKOCYTES IN ULCERATIVE COLITIS:
ELECTRON-MICROSCOPE STUDY.

(E.) Dobbins, III,
. O. (George Washington Univ. Med. Cent., Washing-
on, D.C.). *Am. J. Dig. Dis.* 20(3):236-252, 1975.

iopsy specimens from 14 patients with ulcerative
olitis were examined to investigate the relation of
ne polymorphonuclear leukocyte to the colonic epi-
nelial cell. Both light- and electron-microscope
tudies were made using normal colonic tissue biop-
ies as control. Observations were confined to the
ucosa. Electron micrographs showed apparent intra-
ellular invasion of epithelial cells by polymorpho-
uclear leucocytes in 10 of 14 patients, almost ex-
lusively in cells at the luminal surface, which ap-
eared to be absorptive-type epithelial cells rather
nan goblet cells. Polymorphonuclear leukocytes
ere often seen in luminal contents and ranged from
ormal in appearance to advanced stages of degranu-
ation; they also frequently packed capillary lumi-
. Light microscopy showed numerous polymorphonu-
lear leukocytes within the epithelium, but their
tracellular position could be determined only in
μm sections processed for electron microscopy. In
ne control studies, there were two invasions of an
ithelial cell by a polymorphonuclear leukocyte,
ne in a patient with salmonella colitis and one in
patient with Crohn's disease. The results support
ne concept that the major abnormality in ulcerative
litis resides within the colonic epithelial cell,
d that this cell is frequently invaded by poly-
rphonuclear leukocytes.

98 THE IN VITRO ACTION OF LYMPHOCYTES ON AUTOLOGOUS COLON EPITHELIAL CELLS IN ULCERATIVE
LITIS.

(E.) Hunt, P. S.; Trotter, S. (Prince
nry's Hosp., St. Kilda Road, Melbourne, Victoria
04, Australia). *Aust. N.Z. J. Surg.* 45(2):214-
9, 1975.

e action in culture of peripheral blood lymphocytes
autologous large intestinal epithelial cells was
udied in 13 patients with severe mucosal ulcera-
ve colitis. Two *in vitro* tests of reactivity be-
een peripheral blood lymphocytes and target large
testinal epithelial cells were performed. The iso-
pe release method was used in all patients and
ntrols. Lymphocytes were added in excess to target
cells labeled with ^{51}Cr. Lymphocyte activity was subsequently measured by the quantity of ^{51}Cr released into the supernatant fluid from damaged target cells. The second test of target cell adherence was performed only in patients coming to colectomy and in normal controls. The *in vitro* action of lymphocytes was recorded by their ability to detach live target cells growing as a monolayer in multiple microcultures. Using both methods, the percentage lymphocyte activity was significantly greater in patients with ulcerative colitis when compared with that in normal subjects. Although lymphocyte activity was lower in patients who responded to cortisone than in those eventually treated by colectomy, the difference was not significant. Further control studies showed little lymphocyte activity against autologous skin and ileum, suggesting that autologous lymphocyte-induced damage of large intestinal epithelial cells is a tissue-specific reaction in patients with acute ulcerative colitis. The absence of reactivity in other colonic inflammatory disease also suggests that such increased *in vitro* lymphocyte activity is disease-specific for ulcerative colitis.

7499 HISTOCHEMICAL REACTIONS IN THE WALLS OF THE LARGE INTESTINE IN ULCERATIVE COLITIS.

(E.) Knapik, Z.; Zarzycki, J.; Osaka, A.; Cader, J.; Goetz, B. (Inst. Internal Diseases, Medical Acad., Wroclaw, Poland). *Mater. Med. Pol.* 7(1):24-28, 1975.

Histochemical reactions for succinate dehydrogenase, tetrazolium nictotinamide adenine dinucleotide (NAD)-reductase, akaline phosphatase, ATPase and glucose-6-phosphate dehydrogenase were studied in the walls (mucosae and muscularis) of the large intestine in 30 patients suffering from ulcerative colitis. Morphologic changes in the intestinal mucosa of the patients consisted of lowered height of the cylindrical epithelium, widening of the crypts of Lieberkuhn, and distinct widening and opening of the goblet cells. There was no significant difference in the distribution of the studied enzymes in the elements of the intestinal wall of healthy subjects and the patients with ulcerative colitis. Weaker reactions for ATPase and alkaline phosphatase in the patients indicated a decrease in active transport across tissue barriers in the large intestine and suggested impaired absorption of water in this organ. Additional confirmation of this concept was provided by the decreased intensity of the reactions for succinic dehydrogenase and tetrazolium NAD-reductase, which are involved in the metabolic activity of mitrochondria and redox processes in them. Redox disorders in the intestinal epithelial cells are linked with decreased production of ATP, which is essential in processes of active transport across cell membranes. The observed changes in intensity of the histochemical reactions in ulcerative colitis play no role in the etiology of the disease but are probably due to the effect on the mucous membrane of the large intestine of factors such as toxins, bacteria and mechanical trauma. It is concluded that the behavior of the histochemical reactions as well as morphologic changes in the walls of the intestines in ulcerative colitis are sufficiently characteristic to serve in the diagnosis of this disease.

7500 THE SMALL INTESTINAL DISACCHARIDASE ACTIVITY IN ULCERATIVE COLITIS. *(E.)*

Gudmand-Hoyer, E.; Binder, V.; Soltoft, J. (Gentofte Univ. Hosp., 2900 Hellerup, Denmark). *Gut* 16(1):209-212, 1975.

Small intestinal disaccharidase activity was examined in 12 patients with ulcerative colitis during the active phase of the disease as well as after complete recovery. Small intestinal biopsies were subjected to stereoscopic as well as histologic examination, and the activity of lactase, sucrase and maltase and alkaline phosphatase was determined. Lactose tolerance tests were carried out in all patients and blood sugar was determined. During the active stage of ulcerative colitis a slightly abnormal intestinal mucosa with wide as well as narrow leaf shaped villi but completely normal crypts and a normal lamina propria was found in six patients. During the inactive stage five patients presented a mucosal picture similar to this. Lactase activity was reduced (median 26 IU/g protein) during the acute stage of the disease but not to values indicating lactose malabsorption. In all but one patient, lactase activity rose significantly (to 42 IU/g protein) during remission. Similarly, sucrase and maltase activities were at their lowest during the acute stage of the disease, but there were no differences in alkaline phosphatase activity. It is suggested that previous studies indicating a high incidence of lactase malabsorption in patients with ulcerative colitis may have included a number of patients of races and ethnic groups in whom the incidence of lactose malabsorption is high.

7501 THE INCIDENCE OF LACTOSE MALABSORPTION IN ULCERATIVE COLITIS. *(E.)*

Busk, H. E.; Dahlerup, B.; Lytzen, T.; Binder, V.; Gudmand-Hoyer, E. (Gentofte Univ. Hosp., 2900 Hellerup, Denmark). *Scand. J. Gastroenterol.* 10(3):263-265, 1975.

The incidence of lactose malabsorption in ulcerative colitis was examined in 120 consecutive Danish patients. The diagnosis of lactose malabsorption was based on at least two of the following three criteria: a flat blood glucose curve after ingestion of lactose, but a normal rise in blood glucose after ingestion of glucose and galactose; abdominal discomfort and/or diarrhea after ingestion of lactose; and no or subnormal lactase activity in a jejunal biopsy. Histologically, the jejunal biopsies were normal except for the slight uncharacteristic changes. The prevalence of lactose malabsorption was 9.2%, which was not significantly higher than that in a Danish control group. There was no difference in the distribution according to age and sex, and the incidence was not correlated with the severity of the ulcerative colitis. It is concluded that the high incidence of lactose malabsorption reported in other studies of patients with ulcerative colitis is due to the inclusion of members of racial and ethnic groups in whom lactose malabsorption is a common finding.

7502 IMMUNOGLOBULIN PRODUCTION BY THE RECTAL MUCOSA IN SUBJECTS WITH ULCERATIVE COLITIS. *(E.)*

Fiorilli, M.; Luzi, G.; Aiuti, F. (Dept. Medicine III, Univ., Rome, Italy). *Rend. Gastroenterol.* 7(1):1-4, 1975.

The *in vitro* synthesis of immunoglobulins by rectal mucosa removed at surgery from normal subjects and from patients with ulcerative colitis was studied. Among the ulcerative colitis subjects, six had not received previous immunotherapy, five were treated with salazopyrine or immunodepressors (cortisone and azathiopyrine) and one was evaluated before and after therapy. The rectal tissues were incubated at 37 C for 48 hr in medium containing ^{14}C-L-lysine and ^{14}C-L-isoleucine. Immunoglobulin production was determined by immunoelectrophoresis and autoradiography. The tissues from the ulcerative colitis patients receiving therapy showed an increased synthesis of IgG and, in four cases, an increase in IgA; IgM production was increased in one case and IgD and IgE were synthesized in one other case. Among the salazopyrine-treated patients, immunoglobulin synthesis was not significantly different from that in the untreated subjects. However, synthesis was greatly decreased in the two cases in which immunodepression therapy was combined with salazopyrine treatment. In the patient treated with immunodepressors alone, IgG synthesis remained elevated above normal values. From the data obtained, no definite conclusions can be drawn regarding therapy in ulcerative colitis.

7503 EARLY COLECTOMY IN SEVERE ULCERATIVE COLITIS. *(E.)*

Flatmark, A.; Fretheim, B.; Gjone, E. (Rikshopitalet, Oslo 1, Norway). *Scand. J. Gastroenterol.* 10(4):427-431, 1975.

The treatment of severe attacks of ulcerative colitis over a seven yr period beginning February 1967, using early colectomy in 21 patients with toxic megacolon and 58 patients with fulminating colitis, is described. The preoperative diagnosis of ulcerative colitis was established in all patients by sigmoidoscopy and contrast examination of the large intestine, either by barium enema or a follow through. Macroscopic and histologic examination confirmed the diagnosis of ulcerative colitis in all resected specimens. All patients with toxic megacolon were operated on within 24 hr after admission. Most patients were treated with a two-stage procedure. The acute operation included colectomy, permanent ileostomy, and sigmoidostomy. In these patients the rectum was removed later, usually within three months. Immediate mortality in these 79 patients was 1.2% (one death). Two more patients died in connection with secondary operations. Thus, the overall operative mortality was 3.7%. This compared to a postoperative mortality of 22.2% among 18 patients treated in the preceding seven-yr period. In these patients, there was a prolonged period of medical treatment, including corticosteroid therapy, prior to surgery (generally ileorectal anastomosis). It is concluded that saving the life of the patient, rather than saving the patient from surgery, should have first priority, and this can best be achieved by early colectomy without prednisone treatment.

7504 INIDCATIONS FOR RECTAL PRESERVATION AND ILEO-RECTAL ANASTOMOSIS IN PATIENTS WITH ULCERATIVE COLITIS. *(Fr.)* Mignon, M.; Bonnefond, A.; Vilotte, J.; Soullard, J.; Potet, F.; Lambling, A.; Bonfils, S. (Service de Gastro-enterologie B Hopital Bichat, 170, Blvd. Ney, F 75018 Paris). *Arch. Fr. Mal. App. Dig.* 63(7):541-553, 1974.

A retrospective analysis was run on 48 surgical cases of ulcerative colitis (UC); the patients underwent a total colectomy and a rectal preservation as primary operative procedures. The pre-surgical elements which influence rectal evolution were: the importance of ano-rectal lesions, the intensity of the proctitis, the duration of the sickness, and the existence of a recto-colic cancer. The functional quality of the ileo-rectal anastomosis (IRA) was determined through questioning, clinical and proctological exam and through standard histological study of the rectal mucosa. Of the 48 patients, seven deaths occurred, several of which were linked to conservation of the rectal stump; 17 secondary proctectomies were performed, since frequent rectal hemorrhages occurred. Twenty-eight IRAs were performed, either immediately before or after temporary ileoctomy. For most patients there was little change in socio-professional life or sex life. Contraindications to conservation of the rectum are: peri-anal or peri-rectal suppurations with or without fistulas to the nearby organs, slimming of the ano-rectal diameter, change in the sphincterian apparatus and the existence of cancerous or pre-cancerous lesions.

7505 TOXIC MEGACOLON IN ULCERATIVE COLITIS. *(E.)* Koudahl, G.; Kristensen, M. (Righospitalet, Copenhagen, Denmark). *Scand. J. Gastroenterol.* 10(4):417-421, 1975.

The therapeutic effect of steroid medication in the management of toxic megacolon in 21 of 296 patients with ulcerative colitis was assessed over a 10-yr period. The cases were also analyzed for factors influencing morbidity as well as mortality. The duration of the disease was brief in the majority of the cases, and over half of the patients were over 40 yr. A barium enema, which presumably may provoke dilation of the colon, had been performed in eight cases during the week before the dilatation of the colon was recognized. The ulcerative colitis involved the entire colon in 85%, whereas the dilatation affected predominantly the transverse segment. Fourteen patients were on steroid medication when the dilatation developed. Operation was indicated in 20 patients (colectomy with ileostomy and preserved rectum). Six patients died postoperatively, half of pulmonary complications. Only one death occurred among six patients with perforation of the colon. Postoperative complications occurred in 80%. Both complication rate and mortality were independent of steroid medication. Mortality was lowest among patients treated by a team of internists and surgeons specialized in gastroenterology. This was presumably due to an earlier recognition of the colonic dilatation, intensive medical treatment of severe attacks even before the dilatation had developed, and careful supervision for timing the operation. It is concluded that steroid medication does not improve the results of managing toxic megacolon and that surgery should be performed as soon as corrective measures have been carried out.

7506 SURGICAL CRITERIA IN ULCERATIVE COLITIS. *(Sp.)* Ortega Bevia, J. M. (Facultad de Medicina de Sevilla, Sevilla, Spain). *Hisp. Med.* 32(368):113-114, 117-118, 121-124, 127-128, 131-132, 135, 1975.

7507 NECROTIZING ULCERATIVE COLITIS IN THE NEONATE. *(It.)* Lutati, U. V.; Gavinelli, R. (S. Anna Spec. Prov. Obstet. Gynecol. Hosp., Turin, Italy). *Minerva Pediatr.* 26(37):1869-1871, 1974.

7508 HEMORRHAGING ULCERATIVE RECTOCOLITIS IN CHILDREN. *(Fr.)* Joannard, A.; Bost, M.; Frappat, P. (no affiliation given). *Med. Infant.* 81(5):467-485, 1974.

7509 CARCINOMA OF RECTUM IN ULCERATIVE COLITIS. *(Cz.)* Martinek, K. (Fac. Med., J. Ev. Purkyne Univ., Brno, Czechoslovakia). *Vnitr. Lek.* 20(7):666-669, 1974.

7510 POLICIES AND TECHNIQUES USED IN TOTAL OR SUBTOTAL COLECTOMY TO MAINTAIN CONTINENCE IN PATIENTS WITH ULCERATIVE COLITIS. *(Ger.)* Kuhlmayer, R. (Aus der Chirurgischen Abteilung der Allgemeinen Poliklinik der Stadt Wien, Austria). *Acta Chir. Austriaca* 6(4):86-90, 1974.

7511 CORRELATION OF ENDOSCOPY AND DOUBLE CONTRAST RADIOLOGY IN THE EARLY STAGES IN ULCERATIVE COLITIS AND CROHN'S DISEASE. *(E.)* Laufer, I.; Mullens, J. E.; Hamilton, J. (McMaster Univ. Med. Cent., Hamilton, Ontario, Canada). *Gastroenterology* 68(4):932, 1975.

7512 A CASE OF ULCEROUS COLITIS ASSOCIATED WITH PICA. *(It.)* Di Cagno, L.; Castello, D.; Savio, M. T. (Infantile Neuropsychiatry Sch., Univ. Turin, Turin, Italy). *Min. Ped.* 26(35):1768-1777, 1974.

7513 ULCERATIVE COLITIS, INTESTINAL AMEBIASIS, AND ACQUIRED ICHTHYOSIS. *(Fr.)* Bertrand, J.; Carli-Basset, C.; Jankowski, J. M. (No affiliation given). *Rev. Fr. Gastroenterol.* (108):45-46, 49, 1975.

7514 SKIN LESIONS AS A MANIFESTATION OF ULCERATIVE COLITIS. *(Fr.)* Bertrand, J.; Carli-Basset, C.; Jankowski, J. M. (No affiliation given). *Rev. Fr. Gastroenterol.* (108):37-40, 43, 1975.

7515 ULCERATIVE COLITIS AND ITS COURSE ON X-RAY PLATES. *(Ger.)* Feiereis, H. (Medizinische Hochschule, Lubeck, Germany). *Paediatr. Prax.* 14(4):235-254, 1974.

7516 INTERCURRENT CYTOMEGALOVIRUS COLITIS IN A PATIENT WITH ULCERATIVE COLITIS. *(E.)* Keren, D. F.; Milligan, F. D.; Strandberg, J. D.; Yardley, J. H. (Johns Hopkins Univ. Sch. Medicine, Baltimore, Md.). *Johns Hopkins Med. J.* 136(4):178-182, 1975.

7517 CLINICAL STUDY OF ULCERATIVE COLITIS. *(E.)* Nath, K.; Saxena, S.; Samuel, K. C. (G.S.V.M. Medical Coll., Kanpur, India). *Indian Practitioner* 27(2):79-85, 1974.

7518 AUTOIMMUNE HAEMOLYTIC ANAEMIA AND ULCERATIVE COLITIS. *(E.)* Gorst, D. W.; Leyland, M. J.; Delamore, I. W. (Royla Infirmary, Manchester, England). *Postgrad. Med. J.* 51(596):409-411, 1975.

See also, 7001, 7297, 7438, 7481, 7492, 7494, 7847, 7914, 7920, 7978, 7981, 7983, 7990, 7991, 7993, 8001.

PANCREAS

7519 STUDIES ON THE SYNTHESIS OF PLASMA MEMBRANE PROTEINS OF FIBROBLASTS FROM PATIENTS WITH CYSTIC FIBROSIS. *(Eng.)* Changus, J. E.; Quissell, D. O.; Sukup, M. R.; Pitot, H. C. (Univ. Wisconsin Medical Sch., Madison, Wis. 53706). *Am. J. Pathol.* 80(2):317-328, 1975.

The relative radio-incorporation rates or synthetic rates of the plasma membrane proteins were studied *in vitro* to determine if an alteration in plasma membrane function was responsible for secretory abnormalities of sweat and other exocrine glands characteristic of cystic fibrosis (CF) patients. Fibroblasts established from skin biopsies of four patients with CF and four matched normal controls were labeled with ^{14}C or ^{3}H-leucine, during 2 to 36 hr of exposure during active cell proliferation. The plasma membranes were isolated and subjected to analysis in nondetergent acrylamide gel electrophoresis. Coelectrophoresis revealed the absence of a detectable abnormality in the rates of more than 30 resolved protein species. If genetic alteration of a membrane protein exists in CF, it was not apparent from this study.

7520 PANCREATICOCOLIC FISTULA. *(E.)* Carrillo, R. P.; Strauch, G. O. (Stamford Hosp., Stamford, Conn.). *Conn. Med.* 39(9):530-531, 1975.

A case of colonic fistulization secondary to pancreatic abscess, diagnosed prior to operation and successfully treated, is presented. A summary of previously reported pancreaticocolic fistulas (22 cases) in the English literature is presented in a tabular form. The patient, a 48-yr-old woman, presented with a five-month history of abdominal pain, weakness, weight loss of 30 pounds, anorexia, and intermittent nausea and vomiting. The abdomen was distended, and there was a questionable fluctuant mass in the epigastrium. The rest of the physical examination, except for hypertension of 180/105 mm Hg, was within normal limits. She gave no history of alcohol intake or previous biliary tract disease. Chest x-ray, i.v. pyelogram, upper gastrointestinal series, and small intestine series were interpreted as normal. A p.o. cholecystogram revealed nonvisualization of the gallbladder. A barium enema revealed extravasation of contrast material from the proximal transverse colon, which appeared otherwise normal. The patient's clinical picture was felt to be most consistent with colonic fistulization from a pancreatic pseudocyst or abscess, as a complication of pancreatitis. On the 10th hospitalization day, the patient underwent laparotomy at which time the entire retroperitoneum was found to be involved in ligneous inflammatory disease. The pancreas was grossly enlarged and indurated with a rubbery consistency. During the mobilization of the ascending and right transverse colon an extensive retroperitoneal abscess, containing foul-smelling grayish exudate, was entered. A large sump drain was placed in the most cephalic portion of the abscess cavity, and large Penrose drains were inserted into the subphrenic space. A Stamm gastrostomy completed the procedure. The patient's postoperative course was uncomplicated. The culture taken at the time of operation yielded *Enterobacter aerogenes*. The patient's nutritional status was maintained with elemental diet feedings through the gastrostomy. She was discharged four weeks after operation. At that time all drains and the gastrostomy tube had been removed; antibiotic therapy had been discontinued. The right colostomy was functioning well, and she was well nourished. The authors believe that a gastrostomy for upper gastrointestinal decompression and for possible later feeding should be considered in this type of case which may require aggressive nutritional support. Elemental diets may greatly benefot patients in such circumstances and are very effectively administered by the gastrostomy route.

7521 THE DIAGNOSIS OF NECROTIZING PANCREATIC LESIONS BY MEANS OF DUODENOSCOPIC PANCREATOGRAPHY. ITS VALUE FOR THE SURGICAL PROCEDURE. *(E.)* Weiss, H. D.; Anacker, H.; Kramann, B.; Scholze, H. (Inst. fur Rontgendiagnostik, Klinikums rechts der Isar, Technischen Univ., Munchen, Germany). *Am. J. Gastroenterol.* 64(1):26-33, 1975.

Duodenoscopic retrograde pancreatography directly demonstrated 14 cases of intrapancreatic abscesses and pseudocysts, replacing more indirect methods (e.g., demonstration of air fluid levels, and observable symptoms) used before 1971. Escape of the contrast medium from the excretory duct system into a cavity allowed for the visualization in 13 of 14 cases of abscess or pseudocyst in the pancreas, retroperitoneum, or the peritoneal cavity. Tryptic lesions were usually found to cause perforation of the involved duct; concomitant deformity was general or limited to the lesion vicinity. Pancreatography allowed differentiation between pancreatic abscess and pseudocyst; abscess borders were better deliniated while cyst wall visualization was often impossible. Differential diagnosis of pancreatic abscess and carcinoma was also possible; necrotic cavities possessed well-defined contours as visualized by penetration of contrast medium whereas carcinomas showed diffuse extraductal opacification. In necrotic lesions, either the ductal system was distorted locally or the whole excretory duct system was involved. In carcinoma, the ductal system usually appeared normal, distal to the tumor. Thus, duodenoscopic pancreatography can be useful for the accurate demonstration of the necrotic lesion, its localization, size determination, and for surgical procedure indications. It must be remembered that it is necessary for surgery to follow immediately duodenoscopic pancreatography in patients with pancreatic abscesses or pseudocysts to avoid bacterial infection or hemorrhagic pancreatitis.

7522 UNUSUAL MANIFESTATIONS OF PANCREATIC PSEUDOCYSTS AND THEIR SURGICAL MANAGEMENT. *(E.)* Christensen, N. M.; Demling, R.; Mathewson, C., Jr. (St. Joseph Hosp., Eureka, Calif. 95501). *Am. J. Surg.* 130(2):199-205, 1975.

Six cases representing selected complications of pancreatic pseudocyst are reported and their surgical management is discussed. Mediastinal presentation of a pancreatic pseudocyst was exhibited in a 61-yr-old man. As with many other patients with the same complication, this patient presented with severe bilateral chest pains with only mild epigastric discomfort. Chronic recurrent pleural effusion rich in protein and amylase, as in this case, represents the disruption of the pancreatic duct with formation of a pancreatic pseudocyst or a pancreaticopleural fistula. Internal drainage from below the diaphragm is the treatment of choice in such patients. Jaundice due to a pancreatic pseudocyst was exhibited in a 41-yr-old alcoholic male. This complication is unusual, and to be certain that obstructive jaundice is directly caused by a pancreatic pseudocyst, operative demonstration of compression of the common bile duct by a pseudocyst, relief of the obstruction by surgical drainage of the cyst, and subsequent disappearance of the jaundice are required criteria. Cysts that cause jaundice are located in the head of the pancreas, and cystoduodenostomy is the treatment of choice. I.p. rupture of a pancreatic pseudocyst occurred in a 48-yr-old white female along with coexisting pancreatic ascites. I.p. rupture has been associated with a high mortality rate, but with adequate fluid replacement, prompt evacuation of the cyst contents from the peritoneal cavity, and adequate drainage, the mortality rate can be reduced. Pancreatic ascites is relatively common and may result from a leaking pancreatic pseudocyst, as in this case. Pancreatic ascites produces elevations in both the serum amylase level and protein concentration. When the cyst is small and is located in the tail of the gland, excision is the definitive treatment, but internal drainage remains the treatment of choice when the cyst is large. Massive hemorrhage from a pancreatic pseudocyst occurred in a 59-yr-old male alcoholic and a 40-yr-old non-alcoholic male. This complication is generally due to the rupture of a small aneurysm developing in a branch of the celiac axis in the wall of the pseudocyst. Prompt arteriography is recommended in any patient with a pancreatic pseudocyst who shows signs of bleeding. Pancreaticobronchial fistula occurred as a complication of a pancreatic pseudocyst in a 29-yr-old woman. Treatment should be directed toward adequate subdiaphragmatic drainage of the cyst.

7523 PANCREATIC CHOLERA. STUDIES ON TUMORAL SECRETIONS AND PATHOPHYSIOLOGY OF DIARRHEA. *(Eng.)* Rambaud, J. C.; Modigliani, R.; Matuchansky, C.; Bloom, S.; Said, S.; Pessayre, D.; Bernier, J. J. (Hôpital Saint Lazare, 107 rue du Faubourg Saint Denis, 75010 Paris Cedex 10, France). *Gastroenterology* 69(1):110-122, 1975.

The results of an analytical investigation of digestive secretions and small intestinal and colonic functions in a 38-yr-old female with pancreatic cholera are presented along with results of characterization and estimation in blood and tumoral extracts of gastrointestinal hormones and other biologically active substances. High concentrations of vasoactive intestinal peptide were present in both systemic blood and tumoral extracts. The plasma levels of calcitonin and prostaglandins E and F_{α} were also increased. Gastric inhibitory peptide and gastrointestinal and pancreatic hormones were absent from the tumor, except for small amounts of glucagon. Their levels in the blood were normal. The basal gastric acid secretion was decreased, but it responded normally to pentagastrin stimulation. Both the basal and secretin-stimulated pancreatic secretions were normal. There was an increased volume of gallbladder bile with high bicarbonate and low bile salt concentrations. However, the electrolyte content and flow rate of fluid passing the duodenojejunal junction were normal. The small intestine was the origin of water and electrolyte fasting losses. The jejunum was the site of bicarbonate secretion. Jejunal glucose and leucine-stimulated water and sodium transports were strikingly decreased. However, the absorption rates of sugar and amino acids were normal. The colon reabsorbed high amounts of water and sodium but increased potassium losses. Most of the patient's upper digestive secretion abnormalities and small intestinal function impairments, as concluded from these data, may have resulted from biological effects of vasoactive intestinal peptide. It is suggested that secondary aldosteronism may explain the modified colonic function.

7524 PANCREATIC PSEUDOCYSTS: REVIEW OF DIAGNOSTICS AND THERAPEUTICS. *(It.)* Benini, P.; Carraro, G. (Ospedale Maggiore Ca Granda, Milan, Italy). *Arch. Ital. Chir.* 98(2):155-185, 1974.

7525 PANCREATIC CYSTS. *(It.)* Varola, F.; Beccaria, A.; Oliaro, A.; Sasso, D.; Villata, E.; Cirillo, R. (Ospedale Maggiore di San Giovanni Battista e della Citta di Torino, Italy). *Minerva Chir.* 30(3):83-125, 1975.

7526 PANCREATIC CARCINOMA ON ENDOSCOPIC RETROGRADE PANCREATICO-CHOLANGIOGRAM. *(Ger.)* Anacker, V. H.; Weiss, H. D.; Kramann, B. (Institut fur Rontgendiagnostik der Technischen Universitat Munchen, Munich, Germany). *Frotschr. Rontgenstr.* 122(3):238-242, 1975.

7527 SURGICAL MANAGEMENT OF PANCREAS CARCINOMA: THE PRESENT POSITION. *(It.)* Doldi, S. B.; Germiniani, R.; Gregoratti, L. (Dep. IIIrd Surg. Pathol., Univ. Milan, Milan, Italy). *Minerva Chir.* 30(102):1-15, 1975.

7528 PANCREATIC REACTION MEASURED BIOLOGICALLY AFTER OPACIFICATION OF THE DUCT OF WIRSUNG BY DUODENOSCOPY. PREVENTIVE EFFECT OF FREY'S INHIBITOR. (67 CASES). *(Fr.)* Leger, L.; Liguory, C.; Bouvresse, M.; Souciet, C. (Hopital Cochin, 27, rue du Faubourg-Saint-Jacques, F 75674 Paris Cedex 14 France). *Nouv. Presse Med.* 4(19):1399-1402, 1975.

7529 REACTIVE DUODENAL CHANGES IN CHRONIC PANCREATITIS SIMULATING CONTIGUOUS SPREAD OF PANCREATIC CARCINOMA. *(E.)* Blackstone, M. O.; Mizuno, H. (Dep. Med., Univ. Chicago, Ill.). *Gastroenterology* 68(4):1020, 1975.

7530 COMPLICATIONS OF ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP): ANALYSIS OF 300 CONSECUTIVE CASES. *(E.)* Zimmon, D. S.; Falkenstein, D. B.; Riccobono, C.; Aaron, B. (Manhattan VA Hosp., New York, N.Y.). *Gastroenterology* 68(4):1017, 1975.

7531 THE PANCREAS: A CORRELATION OF FUNCTION, STRUCTURE AND HISTOPATHOLOGY. *(E.)* Waye, J. D.; Adler, M.; Dreiling, D. A. (Mt. Sinai Sch. Med., New York, N.Y.). *Gastroenterology* 68(4):1010, 1975.

7532 HYPERAMYLASEMIA ASSOCIATED WITH CANCER: DEMONSTRATION OF AN ANOMALOUS ISOAMYLASE COMPONENT. *(E.)* Shimamura, J.; Fridhandler, L.; Berk, J. E. (Coll. Med., Univ. California, Irvine, Calif.). *Gastroenterology* 68(4):986, 1975.

7533 NON-PANCREATIC HYPERAMYLASEMIA IN PANCREATIC CANCER. *(E.)* Shimamura, J.; Berk, J. E.; Fridhandler, L. (Coll. Med., Univ. California, Irvine, Calif.). *Gastroenterology* 68(4):985, 1975.

7534 SPECIFIC DETECTION OF ABNORMALLY HIGH LEVELS OF PANCREATIC ISOAMYLASE IN URINE. *(E.)* Shimamura, J.; Fridhandler, L.; Berk, J. E. (Coll. Med. Univ. California, Irvine, Calif.). *Gastroenterology* 68(4):985, 1975.

7535 PANCREATIC CANCER: A CLINICAL OR TISSUE DIAGNOSIS? *(E.)* Livstone, E. M.; Gudjonsson, B.; Spiro, H. M. (Yale Univ. Sch. Med., New Haven, Conn.). *Gastroenterology* 68(4):937, 1975.

7536 IMPORTANCE OF CELIACOGRAPHY IN THE DIAGNOSIS OF CARCINOMA OF THE PANCREAS. *(Sl.)* Rozhold, J.; Klucar, J. (Inst. Postgraduate Medicine Pharmacy, Bratislava, Czechoslovakia). *Rozhl. Chir.* 54(3):186-190, 1975.

7537 COMPLICATIONS AND REOPERATIONS IN THE SURGICAL TREATMENT OF CANCER IN THE MAJOR DUODENAL PAPILLA. *(Rus.)* Zykov, Iu. A.; Kralish, V. V. (Omsk Medical Inst., USSR). *Khirurgiia (Mosk.)* (1):126-132, 1975.

7538 ANNULAR PANCREAS. *(Ger.)* Stauber, R.; Cesnik, H. (Provincial Hosp., Leoben, Austria). *Acta Chir. Austriaca* 6(2):37-40, 1974.

7539 SURGERY OF PANCREATIC PSEUDOCYSTS: RADICAL OR CONSERVATIVE? CASE CONTRIBUTION. *(It.)* Campana, F. P.; Filippini, A.; Bove, E.; Redler, A. (Istituto di Clinica Chirurgiva III, Univ. Rome, Rome, Italy). *Ann. Ital. Chir.* 47(3-4):331-342, 1975.

7540 HYDROKINETIC AND ECBOLIC PANCREAS FUNCTION OF MAN IN RELATION TO AGE. *(Ger.)* Erb, W. (Zentrum der Inneren Medizin der Universitat Frankfurt/M., Germany). *Fortschr. Med.* 93(12):623-626, 1975.

7541 STUDY OF EXOCRINE PANCREATIC SECRETION FOLLOWING STIMULATION WITH LARGE DOSES OF SECRETIN. ACINAR CELL MASS AND SECRETORY CAPACITY. *(Rus.)* Dreiling, D. A.; Greenstein, A.; Bordalo, O. (Mt. Sinai Medical Coll., New York Univ., New York, N.Y.). *Ter. Arkh.* 47(2):23-32, 1975.

7542 THE EVALUATION OF PATIENTS WITH PANCREATIC DISEASE. *(Ger.)* Gulzow, M. (Bereich Medizin, Universitat, DDR-25 Rostock, Ernst-Heydemann-Strasse, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(5/6):323-328, 1974.

7543 PANCREATICOGASTROSTOMY: A FURTHER EVALUATION. *(E.)* Mackie, J. A.; Rhoads, J. E.; Park, C. D. (Harrison Dept. Surgical Res., Univ. Pennsylvania, Philadelphia, Pa.). *Ann. Surg.* 181(5):541-545, 1975.

7544 CHANGING PATTERNS IN THE MANAGEMENT OF PANCREATIC PSEUDOCYSTS. *(E.)* Hastings, P. R.; Nance, F. C.; Becker, W. F. (Louisiana State Univ. Sch. Medicine, New Orleans, La.). *Ann. Surg.* 181(5):546-551, 1975.

7545 AN UNUSUAL, DEADLY BLEEDING COMPLICATION IN CONNECTION WITH CHRONIC-RECIDIVE PANCREATITIS. *(E.)* Bodner, E.; Aufschnaiter, M.; Mikuz, G. (Clinic Geriatric Surgery, Univ. Innsbruck, Austria). *Chir. Gastroenterol.* 8(4):322-326, 1974.

7546 CARCINOMA OF THE EXOCRINE PANCREAS: PATHOLOGIC ASPECTS. *(E.)* Kissane, J. M. (Washington Univ. Sch. Medicine, St. Louis, Mo. 63130). *J. Surg. Oncol.* 7(2):167-174, 1975.

See also, 6822, 6988, 6989, 6991, 6993, 6994, 7000, 7012, 7017, 7030, 7037, 7041, 7049, 7050, 7055, 7057, 7058, 7060, 7067, 7170, 7185, 7396, 7573, 7839, 7847, 7848, 7850, 7879, 7961.

PANCREAS

Pancreatitis

7547 ENDOSCOPIC PANCREATOGRAPHY IN CHRONIC PANCREATITIS. *(E.)* Liguory, C.; Caletti, G. C.; Fontana, G.; Chavy, A. (St. Antoine Hosp., Paris, France). *Rend. Gastroenterol.* 7(1):27-34, 1975.

The value of endoscopic pancreatography in chronic pancreatitis was studied in 68 cases of clinically and biologically diagnosed chronic pancreatitis and 45 cases in which the clinical, biological, radiological, and radio-isotopic data were contradictory or inconclusive. In 27 of the latter 45 patients, endoscopic pancreatography provided unequivocal evidence to substantiate the diagnosis of chronic pancreatitis. In 60 patients, endoscopic pancreatography showed severe diffuse or segmental morphological changes of the main pancreatic duct; these changes were associated with pseudocyst formation in 15 cases and with stones in the main pancreatic duct in 11 cases. The technique enabled establishment of the exact position, size, and form of the cysts and revealed the stones as a filling defect. Localized ductal alterations of a milder degree were found in 11 cases in the form of strictures or marginal indentations. Parenchymography was achieved in 11 cases, but the findings, together with the other minor alterations, were difficult to interpret. A normal pancreatogram was found in 19 cases, including one patient in whom a diagnosis of chronic pancreatitis had been firmly established. The examination was unsuccessful in 23 patients for anatomical obstacles closely related to the underlying disease. The results indicate that endoscopic pancreatography may be of great value in the diagnosis and evaluation of chronic pancreatitis and in providing evidence of obstructions in the pancreatic flow which might require surgery.

7548 THE PROTEINASES AND PROTEINASE INHIBITORS IN THE PERITONEAL EXUDATE DURING ACUTE PANCREATITIS IN THE RAT. *(E.)* Huttunen, R. (Dept. Surgery, Univ. Oulu, 90220 Oulu 22, Finland). *Ann. Chir. Gynaecol. Fenn.* 64(2):82-87, 1975.

Proteolytic enzymes and protease inhibitors in inflammatory exudate were studied during acute pancreatitis in the rat. Adult male Long-Evans rats were killed 2 and 8 hr after induction of pancreatitis by injection of 0.5 ml of 2% sodium deoxycholate into the pancreatic duct. Protein content was estimated by gel filtration column chromatography. Casein, N-α-benzoyl-DL-arginin-4-nitroanilid hydrochloride (BAPNA) and N-acetyl-L-tyrosine (ATEE) were used as substrates. Two pH optima corresponding to the optimal activities were estimated at pH 6 and 8. The peritoneal exudate showed distinct proteolytic and ATEE hydrolyzing activities; BAPNA was also hydrolyzed to a lesser extent. After 2 hr of pancreatitis, the proteolytic activity at pH 6 was 0.71 and at pH 8, 0.77 μM/min/mg of protein. After 8 hr, these values were 0.87 and 0.90, resp. The ATEE hydrolyzing activity was 0.019 and 0.017 μM/min/mg of protein, resp., for 2- and 8-hr pancreatitis. The trypsin inhibiting capacity was determined as 19.7 and 18.8 μg/mg of protein, resp., for 2- and 8-hr pancreatitis. Gel filtration on Sephadex G-200 showed that the BAPNA hydrolyzing activity was eluted with the macroprotein fraction. The trypsin inhibiting capacity was eluted in two peaks after the macroproteins, but the peak in the pancreatitis group was weak; in controls, the peaks were clearly separated and the trypsin inhibiting capacity was more pronounced. These findings suggest that at least part of the pancreatic enzymes are released into the peritoneal cavity and are associated with inhibitors.

7549 THE HYPOCALCEMIA OF ACUTE PANCREATITIS. *(Eng.)* Weir, G. C.; Lesser, P. B.; Drop, L. J.; Fischer, J. E.; Warshaw, A. L. (Massachusetts General Hosp., Boston, Mass. 02114). *Ann. Intern. Med.* 83(2):185-189, 1975.

The mechanism of hypocalcemia in acute pancreatitis was studied by measuring certain variables involved in calcium homeostasis in 11 patients with pancreatitis. Of these patients, two had common-duct stones, one had hereditary pancreatitis, seven were alcoholics (three of whom presented with hypertriglyceridemia) and one had hypertriglyceridemia with an equivocal history of alcoholism. Total and ionized plasma calcium levels were almost uniformly in the low or low-normal range. Magnesium levels were similar, as were the plasma phosphorus values. Plasma parathyroid hormone was elevated in six patients. Plasma calcitonin was below detection levels in the seven patients so studied. Pancreatic glucagon levels were determined in nine patients and were found to be elevated in seven and in the upper normal range in the other two. Plasma gastrin was normal in the ten patients in whom it was measured; renal function was normal in all patients. Triglyceride levels were elevated in four. Parathyroid hormone levels were high, and there was a significant inverse correlation with ionized calcium. These data indicate that the hypocalcemia in acute pancreatitis is not the result of abnormalities of secretion of gastrin, glucagon, or parathyroid hormone. The specific mechanism remains unknown, but it is suggested to be extra-skeletal deposition of calcium, an as yet unidentified defect of bone metabolism, or both.

7550 PANCREATITIS ASSOCIATED WITH IDIOPATHIC HYPERLIPIDEMIA: STUDY OF 40 CASES. *(Fr.)* de Gennes, J. L.; Turpin, G.; Turffert, J. (Hosp. de la Pitie, Paris, France). *Ann. Med. Interne (Paris)* 125(4):333-345, 1974.

Different types of hyperlipidemia associated with acute or subacute pancreatitis were studied in 40 cases. There were no cases of pancreatitis associated with hyperlipidemia due to hypercholesterolemia, but pancreatitis was associated with major and massive hyperglyceridemias, type 1, 4 and 5. Pancreatitis was favored or provoked either directly by hyperlipidemia, by excessive lipid input in types 1 and 5, by excessive calorie input in types 4 and 5, indirectly or directly by estrogens during pregnancy and during the use of oral contraceptives in types 1, 4 and 5, and by alcoholism in type 4. It was found possible to avert or alleviate these types of pancreatitis by normalization of the serum lipid levels. Durable, non-familial hyperlipidemia, actually secondary to acute pancreatitis, was never encountered. There is evidence that hyperlipidemia induces pancreatitis rather than the reverse. The primary status of hyperlipidemia is also supported by the clearly demonstrated genetic character of the disease.

7551 SURGICAL INTERVENTION IN THE TREATMENT OF CHRONIC PANCREATITIS. *(It.)* Zanella, E.; Battistini, C.; Farinon, A. M. (Inst. Special Surgery Pathology Clinic Propedeut., Univ. Parma, Parma, Italy). *Ann. Ital. Chir.* 47(3-4):283-302, 1975.

7552 ACUTE ENZYMATIC PANCREATITIS. *(It.)* Belbusti, F. (Ospedale Civile de Urbino, Urbino, Italy). *Clinica* 31(2):121-126, 1975.

7553 COMPLICATIONS IN ACUTE PANCREATITIS. *(Ger.)* Sommer, H.; Kasper, H. (Medical Clinic, Univ. Wurzburg, Wurzburg, Germany). *Med. Klin.* 70(15):645-651, 1975.

7554 ACUTE BILIARY PATHOLOGY AND ACUTE PANCREATITIS. *(Sp.)* Delgado, Dres. B.; Trostchansky, J. (Hospital de Clinicas "Dr. Manuel Quintela," Monterideo, Uruguay). *Cir. Urug.* 45(1):23-27, 1975.

7555 ACUTE PANCREATITIS IN PREGNANCY AND AFTER DELIVERY. *(Fr.)* Denis, A. (no affiliation given). *Quest Med.* 28(8):465-467, 1975.

7556 THE NATURE OF WATER AND ELECTROLYTE IMBALANCES AND THEIR CORRECTION IN ACUTE PANCREATITIS. *(Rus.)* Shataliuk, B. P.; Makarov, N. A.; Slabkii, P. P.; Kuzniak, V. P. (V. I. Lenin Municipal Hosp., Kamenets-Podolsk, USSR). *Klin. Khir.* (5):60-62, 1975.

7557 FUNCTIONAL VITAMIN A DEFICIENCY IN PATIENTS WITH CHRONIC PANCREATITIS (CP). *(E.)* Toskes, P.; Levy, N. (VA Hosp., Gainesville, Fla.). *Gastroenterology* 68(4):1000, 1975.

7558 THE EFFECT OF ANTICHOLINERGIC AND/OR NASOGASTRIC SUCTION ON THE OUTCOME OF ACUTE ALCOHOLIC PANCREATITIS: A CONTROLLED TRIAL. *(E.)* Switz, D. M.; Vlahcevic, Z. R.; Farrar, J. T. (Med. Coll. Virginia, Richmond, Va.). *Gastroenterology* 68(4):994, 1975.

7559 SIGNIFICANCE OF CARCINOEMBRYONIC ANTIGEN IN PANCREATITIS. *(E.)* Morton, R. E.; Kafka, E. C.; Kalser, M. H. (Univ. Miami, Miami, Fla.). *Gastroenterology* 68(4):961, 1975.

7560 THE PHYSICAL CHEMISTRY OF PANCREATIC CALCIFICATION AND STONE FORMATION: V: LITHOGENICITY AND PANCREATIC "REST" AS A THERAPY FOR PANCREATITIS. *(E.)* Moore, E. W. (Health Sci. Div., Virginia Commonwealth Univ., Richmond, Va.). *Gastroenterology* 68(4):958, 1975.

7561 HYPOTHESIS: HYPOCALCEMIA OF ACUTE PANCREATITIS IS DUE TO RELATIVE HYPOPARATHYROIDISM. *(E.)* Robertson, G. M.; Switz, D. M.; Sizemore, G. W.; Estep, H. L.; Moore, E. W. (Med. Coll. Virginia, Richmond, Va.). *Gastroenterology* 68(4):958, 1975.

7562 STUDIES ON AMYLASE ACTIVITY IN A PATIENT WITH TYPE IV HYPERLIPEMIA AND PANCREATITIS. *(E.)* Mishkin, S.; Bates, J.; Brunton, J.; Lenoff, F.; Schneider, P.; Sniderman, A. (R. Victoria Hosp., Montreal, Quebec, Canada). *Gastroenterology* 68(4):956, 1975.

7563 ENZYMES AND SECRETION OF THE SMALL INTESTINE MUCOSA IN EXPERIMENTAL ACUTE PANCREATITIS. *(Rus.)* Redchits, P. S. (Odessa Medical Inst., Odessa, USSR). *Patol. Fiziol. Eksp. Ter.* 5(2):74-75, 1975.

7564 CHRONIC CALCIFYING PANCREATITIS. *(Por.)* Sarles, H.; Sahel, J. (No affiliation given). *J. Med. (Oporto, Port.)* 86(1637):751-756, 1975.

7565 A PANEL ON PANCREATIC SURGERY. *(Ger.)* Hollender, L. F.; Kummerle, F.; Longmire, W. P.; Trede, M. (Centre Hospitalier Universitaire, F-Strasbourg 67, France). *Langenbecks Arch. Chir.* 338(2):91-107, 1975.

7566 POSTOPERATIVE PANCREATITIS. *(Rus.)* Toskin, K. D.; Myrkin, S. D. (Crimean Medical Inst., USSR). *Khirurgiia (Mosk.)* (1):122-126, 1975.

7567 TOTAL DUODENOPANCREATECTOMY IN CHRONIC PANCREATITIS WITH ABSCESSES. *(Ger.)* Walzel, D. (Barmherzigen Bruder Hosp., Vienna, Austria). *Acta Chir. Austriaca* 6(3):59-62, 1974.

7568 PANCREATITIS IN PATIENTS WITH CHOLELITHIASIS: VALUE OF ELECTIVE SURGICAL TREATMENT OF KNOWN CHOLELITHIASIS. *(Nor.)* Gerner, T. (Ulleval Hosp., Ulleval, Norway). *Tidsskr. Nor. Laegeforen.* 95(2):104-106, 1975.

7569 CHRONIC PANCREATITIS: EVALUATION OF THE TREATMENT OF STEATORRHEA WITH PANCREATIN. *(Por.)* Mott, C. B.; Barros, M. I. B.; Bettarello, A. (Inst. de Gastroenterologia, S. Paulo, Brazil). *Arq. Gastroenterol.* 12(1):37-40, 1975.

7570 MEDICAL THERAPY IN ACUTE PANCREATITIS. *(Ger.)* Preisich, P. (II. Medizinische Klinik, Semmelweis-Krankenhaus, Budapest, Hungary). *Leber Magen Darm* 5(1):26-29, 1975.

7571 A PROSPECTIVE STUDY OF ACUTE PANCREATITIS. *(E.)* Imrie, C. W.; Whyte, A. S. (Glasgow Royal Infirmary, Glasgow, Scotland). *Br. J. Surg.* 62(6):490-494, 1975.

7572 CLINICAL AND HORMONAL ASPECTS OF PANCREATIC DIABETES. *(E.)* Bank, S.; Marks, I. N.; Vinik, A. I. (Univ. Cape Town, Cape Town, South Africa). *Am. J. Gastroenterol.* 64(1):13-22, 1975.

7573 PREGNANCY AND PANCREATITIS. *(E.)* Dreiling, D. A.; Bordalo, O.; Rosenberg, V.; Rudick, J. (Mount Sinai Sch. Medicine, New York, N.Y.). *Am. J. Gastroenterol.* 64(1):23-25, 1975.

7574 THE ROLE OF LYSOSOMAL HYDROLASES IN THE PATHOGENESIS OF ACUTE PANCREATITIS. *(E.)* Dlugosz, J. (Med. Acad., Bialystok, Poland). *Matern. Med. Pol.* 6(4):260-270, 1974.

See also, 6610, 6808, 6812, 6991, 6994, 7017, 7037, 7041, 4050, 7056, 7330, 7522, 7529, 7530, 7534, 7541, 7542, 7545, 7759, 7898.

LIVER AND BILIARY TRACT

7575 METABOLISM OF LITHOCHOLATE IN HEALTHY MAN. II. ENTEROHEPATIC CIRCULATION. *(E.)* Cowen, A. E.; Korman, M. G.; Hofmann, A. F.; Cass, O. W.; Coffin, S. B. (Mayo Clinic Foundation, Rochester, Minn. 55901). *Gastroenterology* 69(1):67-76, 1975.

The enterohepatic circulation of lithocholate and its metabolites was studied in four healthy fasted subjects. The intestinal absorption of labeled sulfolithocholylglycine or lithocholylglycine was studied after the intrajejunal instillation of these substances, mixed with the subject's own bile; a triple lumen tube was positioned with its occluding balloon in the third portion of the duodenum. The intestinal absorption of lithocholylglycine or sulfolithocylylglycine relative to cholyltaurine was also studied following the ingestion of a test meal containing these substances, and the metabolism of the steroid and sulfate moieties of sulfolithocholylglycine was studied after the administration of these substances to two subjects under identical conditions. Finally, the lithocholate pool size and input into the total lithocholyl pool were determined using isotope dilution techniques. When mixed with the bile and infused into the jejunum, radiolabeled lithocholylglycine was absorbed more rapidly and more efficiently than sulfolithocholylglycine. When these metabolites were administered in a test meal, 60% of the lithocholylglycine was conserved, but only 20% of the sulfolithocholylglycine was conserved. The daily input of lithocholate into the bile acid pool averaged 100 mg/day, about one third to one-half of the chenodeoxycholic acid synthesis, but the half life was only 0.74 day. The small lithocholate pool (about 100 mg) could be explained by rapid fecal excretion caused by sulfation, which decreases absorption in the jejunum and active absorption in the ileum. There was little desulfation during enterohepatic cycling, but rapid desulfation occurred in the distal intestine, the absorption of ^{35}S being followed by urinary excretion. A decreasing $^{35}S{:}^{3}H$ ratio in the bile indicated that some steroid moiety was conserved to be resulfated. The data indicate that considerable lithocholate is absorbed from the distal intestine in healthy subjects but that efficient sulfation and rapid fecal excretion result in a small total lithocholate pool. A multicompartment model, previously used to describe the metabolism of the steroid and amino acid moieties of the major conjugated biliary acids, was extended to encompass lithocholyl conjugates and their sulfates.

7576 METABOLISM OF LITHOCHOLATE IN HEALTHY MAN. III. PLASMA DISAPPEARANCE OF RADIOACTIVITY AFTER INTRAVENOUS INJECTION OF LABELED LITHOCHOLATE AND ITS DERIVATIVES. *(E.)* Cowen, A. E.; Korman, M. G.; Hofmann, A. F.; Thomas, P. J. (Mayo Clinic Foundation, Rochester, Minn. 55901). *Gastroenterology* 69(1):77-82, 1975.

The plasma disappearance of i.v. radiolabeled lithocholate, lithocholylglycine, and their respective 3-sulfates was defined in four healthy adult male volunteers. The ^{14}C-labeled (10 μCi) or ^{3}H-labeled (25 μCi) bile acids were injected into the antecubital veins, and blood samples were obtained from the opposite antecubital vein 2 to 120 min later. Urine was also collected for 24 hr after injection, and bile was aspirated through a double lumen tube for 4 hr after injection. Binding of the bile acids to serum protein was measured by ultrafiltration and the radioactivity in the plasma, urine, and bile was measured by scintillation counting. Lithocholate and lithocholylglycine disappeared rapidly from the plasma, both showing a plasma half-life of less than three min. However, after 15 min, when 99% of the radioactivity had been cleared, the disappearance curve flattened, and chromatography suggested that the chemical form of circulating radioactivity had become sulfolithocholylglycine, the end product of the hepatic metabolism of lithocholate in man. I.v. sulfolithocholate and sulfolithocholylglycine were cleared from the plasma about one-fourth as rapidly as lithocholate and lithocholylglycine. Lithocholate and its derivatives were tightly bound to the serum proteins (87-99%); for a given steroid moiety and mode of conjugation, binding was altered slightly by sulfation, but all sulfated derivatives were also bound tightly (greater than 95%) to the serum protein. The results indicate that sulfation decreases the net flux of lithocholate into the biliary system as well as the extent to which the micelle binds lithocholate derivatives. Further, each bile acid in the plasma has a different input and a different removal rate, and it is the dynamic equilibrium between these that determines the pattern of plasma bile acids during fasting and postprandially.

7577 EFFECT OF AGE ON LIVER FUNCTION. *(E.)* Kampmann, J. P.; Sinding, J.; Moller-Jorgensen, I. (Frederiksberg Hosp., Copenhagen, Denmark). *Geriatrics* 30(8):91-95, 1975.

Age-dependent variations in liver function and in the retention of BSP and iodine 131-labeled rose bengal were studied in 53 subjects aged 50 yr or more. All subjects had minor arteriosclerotic or functional disorders but no liver, kidney, or bone disease. The serum total bilirubin, alkaline phosphatase, and GOT values were determined and the serum proteins were analyzed by paper electrophoresis. Liver biopsy specimens were examined histologically, and the retention of BSP and ^{131}I-rose bengal was determined following the i.v. injection of these substances. The histological studies confirmed the normalcy of the liver in all but ten subjects; these ten were excluded from the study. The serum bilirubin, alkaline phosphatase, and GOT values were unaltered with increasing age, as was the retention of BSP and ^{131}I-rose bengal. There were no variations with regard to sex. The median of the 45-min BSP retention test was 4.2%, with a ninth decile of 7.5%. The median of the retention of ^{131}I-rose bengal was 32%, with a ninth decile of 39.4%. The variance in retention values of both BSP and ^{131}I-rose bengal was similar in all age groups. The data illustrate the necessity of histologic confirmations of liver normalcy in studies of this nature. Had the data from the ten subjects excluded from the study on the basis of their liver biopsy results been included, the results of the study would have been seriously distorted, especially with regard to the retention of BSP and ^{131}I-rose bengal.

7578 ALCOHOL AND ITS DRUG INTERACTIONS. *(E.)* Seixas, F. A. (Natl. Council Alcoholism, Room 1720, 2 Park Ave., New York, N.Y. 10016). *Ann. Intern. Med.* 83(1):86-92, 1975.

The absorption and metabolism of alcohol are reviewed, as are alcohol-drug interactions of importance in current clinical practice in the United States. Alcohol is absorbed from the mucous membranes of the oral cavity, stomach, and intestines, producing an inflammation at all these sites. Ethanol enhances the absorption of antibiotics, nitroglycerine, and industrial toxins such as mercury vapor and lead. The major pathway of alcohol metabolism is through oxidation in the liver by the zinc-containing enzyme, alcohol dehydrogenase, to acetaldehyde. Alcohol dehydrogenase also metabolizes drugs such as methanol and ethylene glycol and is inhibited by phenylbutazone and the diuretic, ethacrynic acid. There is considerable evidence to indicate that, at higher doses of ethanol, the activity of alcohol dehydrogenase remains constant and the alcohol induces the oxidizing activity of the hepatic microsomes. Since warfarin, dilantin, and tolbutamide are also metabolized by the microsomal ethanol-oxidizing system, the half-lives of these drugs are reduced in alcoholic subjects; CCl_4 toxicity is enhanced in alcoholics by a similar mechanism. In addition, alcohol decreases the plasma cation, potassium, and magnesium concentrations, can lower the plasma phosphate concentration, increases the plasma uric acid concentration, interferes with hepatic gluconeogenesis, and interacts with puromycin C to produce fatty liver. When alcohol is taken after pretreatment with disulfiram, flushing, tachycardia, dyspnea, and shock occur; a similar reaction occurs when alcohol is taken in conjunction with calcium carbamide, phentolamine, chloramphenicol, tolbutamide, furazolidone, griseofulvin, quinacrine, and metronidazole. General analeptics, such as picrotoxin and pentylenetetrazole, tend to produce convulsions in the presence of large amounts of alcohol, and milder stimulants increase the deterioration of performance with smaller doses of ethanol. All sedative-hypnotic drugs act synergistically or at least additively with alcohol and a wide variety of congeners found in alcoholic beverages may produce heightened gastrointestinal distress, acute hypertensive crisis, or cardiomyopathy. The physician is cautioned about the use of alcohol by patients taking other medications and about the difficulty frequently encountered in ascertaining the extent of the patient's alcohol ingestion.

7579 A SPECIFIC HEPATOBILIARY ALKALINE PHOSPHATASE: 5'-NUCLEOTIDASE.

(Fr.) Moretti, G.; Staeffen, J.; Ballan, P.; Ferrer, J.; Dubecq, J. P.; Roques, J. C.; Beylot, J.; Broustet, A.; Amouretti, M.; Series, C. (St. Andre Hosp., Bordeaux, France). *J. Med. Lyon* 54(1240):37-56, 1973.

The serum 5'-nucleotidase levels were studied in 650 patients with different diseases. The upper limit of the normal value was fixed at 15 IU/l in 120 normal subjects. For children (40 cases), pregnant women (65 cases), aged persons (12 cases), and subjects with various bone diseases (19 cases), the 5'-nucleotidase levels were normal but the alkaline phosphatase levels were significantly elevated. The alkaline phosphatase level was elevated in all 19 cases of metastatic bone cancers of various origin, but the 5'-nucleotidase was abnormally high in only seven cases. The alkaline phosphatase levels were elevated in 97% of the 27 cases of secondary cancer of the liver, and the 5'-nucleotidase level was elevated in 90% of all cases, thus indicating the hepatic origin of alkaline phosphatase. The 5'-nucleotidase level was above normal in all ten cases of primary liver cancer. The 5'-nucleotidase and alkaline phosphatase levels were elevated in 52% and 61% of the 56 cases of compensated alcoholic cirrhosis, and in 30% and 70% of all cases of decompensated alcoholic cirrhosis, resp. The 5'-nucleotidase levels fluctuated between very high and normal levels in 30 cases of viral hepatitis. Increased 5'-nucleotidase levels up to 230 IU/l were found in 34 cases of persistent cholestasia by subhepatic obstruction. Elevated 5'-nucleotidase was significantly correlated with increased alkaline phosphatase throughout the study, while a number of conditions produced a rise in alkaline phosphatase without a corresponding rise in the 5'-nucleotidase level. It is concluded that 5'-nucleotidase increases in all conditions in which hyperphosphatemia is of hepato-biliary origin. This rise is marked in cholestasis of neoplastic or lithiasic origin.

7580 USE OF FACTOR-VII-RICH PROTHROMBIN COMPLEX CONCENTRATE IN LIVER DISEASE.

(E.) Green, G.; Dymock, I. W.; Poller, L.; Thomson, J. M. (Univ. Hosp. South Manchester, England). *Lancet* 1(7920): 1311-1314, 1975.

An attempt was made to improve blood coagulation with parenteral administration of a prothrombin complex concentrate of factors II, VII, IX, and X. Of 13 patients studied, seven had cirrhosis, two chronic active hepatitis, two drug-induced hepatitis, and two collagen disorders associated with hepatocellular dysfunction. If prothrombin time was abnormal, vitamin K_1 was given (10 mg/day for three days, i.m.) and prothrombin time was again determined. In patients whose prothrombin time was still 3 sec or more longer than the control 72 hr after vitamin K_1 administration, the concentrate was infused before liver biopsy. There was no clinical evidence of bleeding during liver biopsy in any patient. Prolonged prothrombin time improved in every case: preinfusion values ranged from 15 to 20 sec (mean 17), compared with postinfusion values of 15 sec or less (normal, 11-13). Preinfusion factor VII levels ranged from 25% to 70% (mean 44%), compared with postinfusion activities of 100% or more (mean, 135%). Prolonged cephalin times were recorded in six cases before treatment, but there was a significant shortening at four hr after infusion from a mean of 60 sec to 51.5 sec (normal, 38-45 sec). There was a significant elevation of factor V levels postinfusion. No changes were observed in platelet count or euglobulin lysis times. Prolonged thrombin fibrinogen time preinfusion persisted after infusion. It is concluded that the factor-VII-rich concentrate may be the treatment of choice in patients with liver disease who require a temporary correction of their coagulation defect.

7581 THE EFFECT OF INTRAVENOUS TRANSFUSION OF FAT EMULSIONS ON LIVER STRUCTURE.

(Rus.) Raikhlin, N. T.; Sudzhan, A. V. (Inst. Exp. Clin. Oncol., Moscow, U.S.S.R.) *Eksp. Khir. Anesteziol.* (1):79-81, 1975.

Morphological studies were conducted on liver biopsies taken during surgery from 31 patients with cancer of the esophagus and stomach who had been given i.v. infusions of 10% and 20% Intralipid (soybean oil emulsion) and 15% Lipofundin (cotton seed oil emulsion) preoperatively. Side reactions consisted of fever, tachycardia, facial hyperemia, nausea, and occasional chills. A characteristic lipid pigment was detected in the Kupffer cells and the endothelium of hepatic blood vessels in six patients who had been given four or five infusions of 15% Lipofundin and in three patients who received six infusions of 20% Intralipid. No pigment deposits were observed in any of the patients who received 10% Intralipid. The clinical significance of these deposits is unknown. No other changes were observed which might be attributed to the fat emulsions.

7582 RECONSTRUCTION OF INTRAHEPATIC BILE DUCTS IN CONGENITAL BILIARY ATRESIA.

(E.) Chiba, T.; Kasai, M.; Sasano, N. (Tohoku Univ. Sch. Med., Sendai, Japan). *Tohoku J. Exp. Med.* 115(2): 99-110, 1975.

The major intrahepatic bile ducts extending from the portal hepatic vein to the periphery of the liver were studied in cases of biliary atresia. Case reports are also presented. Autopsy specimens obtained from seven cases of biliary atresia were fixed, cut into blocks of tissue 2000-2500 µm, and dehydrated with alcohol. The blocks were paraffin-embedded in six cases, and celloidin-paraffin embedded in the last case. Serial sections (6 µm) were stained with elastica-Masson and hematoxylin and eosin. Gross findings of the extrahepatic bile ducts were classified as Kasai type I in two cases, type II in one case, type IIIa in one, and type IIIb in the remaining three cases. The main intralobular bile ducts were usually patent throughout the whole length of the liver, regardless of the type of extrahepatic biliary atresia. Microserial reconstruction of bile ducts and ductules of a small portal tract performed in one case (a female, aged four and one-half months at death) showed a number of ductules forming a network around the main duct, and in some cases, communicating with it. The postoperative complication of severe ascending cholangitis seemed to be an important cause of destruction or disappearance of intrahepatic bile ducts in one case, a female aged seven and one-half months at death. These data support the suggestion that active secretion of bile is present in many patients after operation for biliary atresia, and is seen in older infants without the postoperative complication of ascending cholangitis. Operation for biliary atresia early in life is recommended.

7583 OMENTAL ARTERIOVENOUS FISTULA FOLLOWING LIVER BIOPSY. *(Eng.)* Satava, R. M.; Van Heerden, J. A.; Sheedy, P. F., II; Summerskill, W. H. J. (Mayo Clinic, Rochester, Minn. 55901). *Gastroenterology* 69(2):492-495, 1975.

A case of iatrogenic omental arteriovenous fistula attributable to an earlier unsuccessful liver biopsy is described. A 29-yr-old woman was hospitalized with a 24-hr history of large, bloody stools, vague lower abdominal cramps, and a recent onset of fatigue. The pertinent history included quiescent chronic ulcerative colitis, diagnosed 13 yr earlier, and chronic active liver disease. In addition, 5 yr previously she had undergone a splenorenal shunt for massive upper gastrointestinal bleeding from esophageal varices. A liver biopsy performed 3 yr prior to admission revealed no liver tissue; the biopsy was technically difficult, required several passes and the use of two needles, and was followed by pain in the upper right quadrant which required further hospitalization. The patient had been asymptomatic for the 5 yr preceding her present admission. The liver was palpable and there was a loud continuous bruit over the right upper quadrant of the abdomen. However, there was no jaundice nor cutaneous stigmas of chronic liver disease, nor any evidence of ulcerative colitis. The patient was given transfusions to raise her lowered serum hemoglobin (9.9 g/dl), but the stools remained guaiac-positive. The results of a barium enema and upper gastrointestinal series were normal. A visceral angiogram, however, revealed a large arteriovenous fistula located adjacent to the hepatic flexure of the colon with the major arterial supply arising from the right gastroepiploic artery and from an epiploic branch of the right colic artery. A diagnosis of omental arteriovenous fistula was confirmed at laparotomy; the epiploic branch of the right gastroepiploic artery and the epiploic branch of the right colic artery were ligated, whereupon the mass collapsed. Right hemiomentectomy was performed by individually ligating the varices at the serosal surface of the colon. The postoperative course was uneventful, and followup 5 mo later revealed no further symptoms. Visceral arteriovenous fistula should be considered as a cause of gastrointestinal hemmorrhage in patients who have previously undergone liver biopsy, although this is an unusual complication of this procedure.

7584 HAZARDS OF STEROID THERAPY IN HEPATIC FAILURE. *(E.)* Cunliffe, W. J.; Burton, J. L.; Holti, G.; Wright, V. (Gen. Infirm., Leeds, England). *Br. J. Dermatol.* 93(2):183-185, 1975.

Three cases are presented in which patients with skin disease and liver failure (45 to 55 yr old) developed serious systemic side effects from steroid therapy. Two had psoriasis with intermittent erythroderma and one had constitutional eczema. All were chronic alcoholics with hepatomegaly; two were presistently jaundiced. The two psoriatic patients had applied undiluted flourinated steroids (up to 100 g/day) for 3-4 yr. The eczema patient had taken betamethasone (0.5 mg twice daily) for six months. The psoriatic patients developed the cutaneous complications of topical glucocorticoid therapy (purpura, striae and thin skin) as well as Cushingoid facies and buffalo hump. Each had two emergency admissions for malaise, drowsiness, hypotension, erythroderma and dehydration, occuring after failure to apply the corticosteroids for several days. Adrenal insufficiency was diagnosed. All three patients also developed aseptic necrosis of the femoral head of the talus. It is concluded that liver failure was a contributing factor to the development of complications in steroid therapy.

7585 BIOCHEMICAL SERUM INDICES IN VARIOUS LIVER DISORDERS. *(Rus.)* Tokarskaia, Z. B.; Chernova, G. B.; Dorozhko, V. A. (Inst. Biophysics, Moscow, USSR). *Ter. Arkh.* 46(4):53-58, 1974.

The isoenzymic composition of alkaline phosphatase in the blood, present during various liver diseases, was studied to more accurately define diagnostic possibilities and also for the additional characterization of the pathogenic mechanisms of such diseases. Altogether, 160 persons, including a group of 52 practically healthy individuals, a group of 24 individuals in their recovery or preterminal stages (less than 2 mo before their death) having various nonhepatic diseases, such as blood and cardiovacular diseases, acute respiratory diseases, tumors, etc., and a group of 82 individuals in their recovery or preterminal stages with various diseases of the hepato-biliary system were examined for levels of isoenzymes of alkaline phosphatase, lactated hydrogenase, and anomalous lipoprotein X. The presence of anomalous lipoprotein X was the most specific sign of extra- and intrahepatic cholestasis. It was determined that lipoprotein X does not appear immediately after the beginning of jaundice but only 10 to 14 days after its beginning, so it was not observed in quickly-resolved jaundices. The observed increase of the activity of normal hepatic alkaline phosphatase in mechanical jaundice, but not in preterminal conditions and not in parenchymatous hepatitis, was most probably caused by portal hypertension. In all hepatobiliary diseases, the anomalous hepatic fraction of alkaline phosphatase localizing between α_1 and α_2-globulins was most often revealed. The most mobile hepatic fractions of alkaline phosphatase localizing in the cathode region of albumins were revealed in severe preterminal conditions both accompanied by jaundice and without it. Significant increase in intestinal alkaline phosphatase content was observed in liver cirrhosis; less significant increases were seen in infectious hepatitis. The long-term corticosteroid therapy in adults caused appearance of a small amount of bone alkaline phosphatase.

7586 LIVER DISEASE IN INFANCY: HISTOLOGICAL FEATURES AND RELATIONSHIP TO α_1-ANTITRYPSIN PHENOTYPE.

(E.) Talbot, I. C.; Mowat, A. P. (King's Coll. Hosp., London, England). *J. Clin. Pathol.* 28(7): 559-563, 1975.

The specificity and frequency of periodic acid-Schiff (PAS)-positive material in tissues of α_1-antitrypsin deficient (PiZZ) infants was investigated. Sixty-six liver biopsies and three postmortem liver specimens from 53 infants with neonatal hepatitis were examined without knowledge of the PiZZ state. In three cases, all PiZZ, cholestatic hepatitis was accompanied by glandular transformation of periportal hepatocytes and prominent dilated periportal ductular structures near the canals of Hering. Evidence of more active infiltration with a more dense infiltrate was seen in follow-up biopsies of two PiZZ individuals. Diatase-resistant, PAS-positive, pure magenta-colored, sharply defined globules (2-20 μ in diameter) were found in periportal and periseptal hepatocytes of eight infants biopsied after 12 weeks of age. These globules were distinct from the irregular fragments of similar periportal Kupffer cells or microphages of liver tissue irrespective of the Pi state. PAS-positive globules in liver parenchyma cells are a useful diagnostic feature of α_1-antitrypsin deficiency in infants of more than 12 weeks of age.

7587 DEFICIENCY OF α_1-ANTITRYPSIN.

(Dut.) Jansveld, C. A. F.; Dijkman, J. D. (Univ. Clinic Internal Diseases, Longartsen, The Netherlands). *Ned. Tijdschr Geneeskd.* 118(36):1366-1372, 1974.

Symptomatology, genetic and pathophysiological aspects, and prevalence of α_1-antitrypsin deficiency are discussed on the basis of three cases. Dyspnea was the first symptom of the disease in three male patients between 30 and 40 yr of age. Pulmonary emphysema and symptoms of chronic obstructive pulmonary disease type A were determined. All three patients were homozygous for the Pi^Z gene (phenotype, PiZZ) for which a serum α_1-antitrypsin level of 15% of the normal value is characteristic. Significant reduced serum α_1-globulin, α_1-antitrypsin level and activity were found in all three cases. Acidophilic material and PAS-positive globules may be present in the liver. Emphysema in α_1-antitrypsin deficiency is probably due to gradual disintegration of lung tissues as a result of the insufficient inhibition of proteases released from lung macrophages, leukocytes, or bacteria. Deficiency of α_1-antitrypsin also causes a predisposition to neonatal hepatitis and to cirrhosis in children and adults. The prevalence of phenotype PiZZ is estimated at one in 1,000 to one in 2,000 births. Intermediary α_1-antitrypsin deficiency (phenotype PiMZ) occurs in about 5 to 6% of the population, but its symptomatology is slight.

7588 NONCIRRHOTIC PRESINUSOIDAL PORTAL HYPERTENSION ASSOCIATED WITH CHRONIC ARSENICAL INTOXICATION.

(E.) Huet, P. M.; Guillaume, E.; Cote, J.; Legare, A.; Lavoie, P.; Viallet, A. (Saint-Luc Hosp., Montreal, Canada). *Gastroenterology* 68(5):1270-1277, 1975.

A case report is presented of a 39-yr-old man with idiopathic portal hypertension after prolonged ingestion of an arsenic preparation. The patient had an 11-yr history of psoriasis, for which the arsenic had been prescribed. There was no history of liver disease or alcohol abuse. Splenomegaly but not hepatomegaly was observed. Liver function tests were normal. Esophagogastroscopy showed esophageal varices more than 4 mm wide without gastric lesion. Deep needle biopsy of the liver showed nonspecific changes and slight dilation of portal veins in some of the portal tracts. Esophageal varices, a patent portal vein, and an unusual intrahepatic portal vein distribution were seen on retrograde splenography and portagraphy. There was dilation, tortuosity, and anarchic orientation of portal vein radicles up to the periphery of the liver, with opacification of a capsular network. Superior mesenteric and celiac arteriographies showed an unusually large (11 mm wide) and tortuous splenic artery. The portohepatic gradient was 17 mm Hg (normal, less than 5 mm Hg). The diagnosis was idiopathic perisinusoidal portal hypertension with patent portal vein and normal liver architecture. A splenorenal anastomosis was performed three weeks after admission. Wedge biopsy of the left lobe of the liver showed normal liver morphology, except for slight dilation of 25% of the small portal branches and nonspecific focal necrosis. The postoperative course was uneventful. This case and three others previously reported suggest that arsenic may have a toxic effect on the liver, leading to portal hypertension without cirrhosis.

7589 GALLBLADDER AND LIVER INFARCTION OCCURRING AS A COMPLICATION OF ACUTE BACTERIAL ENDOCARDITIS.

(E.) Henrich, W. L.; Huehnergarth, R. J.; Rosch, J.; Melnyk, C. S. (Univ. Oregon Med. Sch., Portland). *Gastroenterology* 68(6):1602-1607, 1975.

A case of acute bacterial endocarditis is described in which systemic embolization was a striking feature with involvement of the cystic and hepatic arteries. A 45-yr-old woman was hospitalized with a 3-day history of fever, chills, increasing dyspnea, and malaise. There was no prior history or symptoms suggestive of gallbladder or liver disease. There were numerous splinter hemorrhages in the nail beds and petechial lesions on the volar surfaces of the fingers, toes, soles of the feet, and in the conjuctivae and fenulum of the tongue. Subcrepitant rales were present in both lungs. The bowel sounds were slightly hypoactive and there was tenderness in the left upper quadrant that had the murmur of mitral regurgitation on auscultation. Mild pulmonary vascular congestion, slight cardiomegaly, and sinus tachycardia were further revealed. The presumptive diagnosis of acute bacterial endocarditis was confirmed by blood cultures positive for coagulase-positive *Staphylococcus aureus*. Therapy included penicillin, nasal oxygen, and digitalization. The patient began to pass frequent bloody stools, and visceral arteriography revealed massive intestinal bleeding from an arteriovenous fistula. I.v. Pitressin infusion (0.2 μ/min) was effective in stopping the bloody diarrhea. Eighteen hr later, the patient complained of exquisite right upper quadrant pain. Laparotomy revealed a black infarcted gallbladder and multiple hepatic infarcts. A cholecystectomy was performed and several terminal ileal and cecal arteries supplying the arteriovenous malformation were ligated to prevent further bleeding. Twenty-four hr later, the patient again began to pass bloody stools and several days later the terminal ileum and proximal right colon were resected. The patient had an uneventful convalescence thereafter with no further intestinal bleeding; but just before discharge she suddenly became hypotensive, had a cardiorespiratory arrest, and could not be resuscitated. At autopsy, 2 liters of blood were found in the right upper abdominal quadrant, areas of necrosis were identified on the right hepatic lobe, an infarct was observed in the right kidney, and there was an acute endocarditis of the mitral valve. Death appeared to have resulted from i.p. bleeding due to erosion of an hepatic artery adjacent to an area of hepatic infarction. It is concluded that in a setting of multiple embolic events from acute bacterial endocarditis, gallbladder infarction should be included in the differential diagnosis when right upper quadrant pain or signs and symptoms of acute abdomen appear.

7590 MANAGEMENT OF ENDOGENOUS HEPATIC COMA. *(Ger.)* Czygan, P.; Ast, E.; Kommerell, G. (Medizinische Universitatsklinik, 6900 Heidelberg, Bergheimer Strasse 58, Germany). *Inn. Med.* 2(3): 172-178, 1975.

Different methods used to treat hepatic coma are reviewed. Mortality rates in patients given exchange transfusions, plasmapheresis, homologous and heterologous cross-circulation, and immunotherapy with hepatitis B immunoglobulin do not differ appreciably from those obtained in patients receiving basic therapy even though the methods mentioned cause temporary improvement of hepatic encephalopathy. Extracorporeal perfusion, using baboon liver, does not appear to reduce the mortality and is not accompanied by complications such as hemorrhagic diathesis, hyaline membrane disease, or refractory hypoglycemia. A mortality of 41.5% has been obtained with the rapid wash-out method, but the technique is difficult and requires specially trained personnel. In one study, L-dopa improved hepatic encephalopathy significantly in five of nine patients, but no other investigators have been able to confirm these results. Perfusion of blood, using activated charcoal to adsorb toxic substances, offers a simple method which is safe for both the patient and medical personnel. Survival rates of patients treated with this technique appear to be about 40%. When the author employed this method using activated charcoal coated with collodion on five patients, two improved but only one survived. No microembolisms were detected in any of the 17 treated patients who died. The cause of death was massive cerebral edema in more than 70%.

7591 ENTEROHEPATIC ACRODERMATITIS: A ZINC DEFICIENCY SYNDROME? *(Nor.)* Krogh, H. K.; Syversen, T. (General Dept., Haukeland Hosp., Haukeland, Norway). *Tiksskr. Nor. Laegeforen* 95(3):152-155, 1975.

Enterohepatic acrodermatitis as a zinc deficiency syndrome is discussed on the basis of two obstinate cases in a brother and sister. The disease appeared in both cases at an age of 3 to 4 mo after the termination of breast-feeding. Prolonged therapy with Diodoquin (diiodo-8-hydroxyquinoline) and Siosteran (dichloro-8-hydroxyquinoline) was not successful; relapses kept occurring. The abnormally low zinc level in the serum prompted Solvezink therapy (135 mg/day, p.o.) which resulted in total normalization in about 6 mo, and in a slightly above-normal serum zinc level. The serum zinc levels were normal in the parents. The findings indicate that zinc deficiency due to reduced absorption as a result of chelate formation with an oligopeptide may be an essential etiological factor in enterohepatic acrodermatitis. The manifestation of the disease after the termination of breast-feeding is probably due to the reduced zinc content of cow milk as compared with mother's milk.

7592 HEPATIC DISEASE IN ERYTHROPOIETIC PROTOPORPHYRIA. *(E.)* Bloomer, J. R.; Phillips, M. J.; Davidson, D. L.; Klatskin, G. (Yale Univ. Sch. Medicine, New Haven, Conn. 06510). *Am. J. Med.* 58(6):869-882, 1975.

Studies of hepatic structure and function were made in two sisters with erythropoietic protoporphyria. The first patient (33 yr old) had life-long jaundice and photosensitivity. Autopsy showed a patent extrahepatic biliary tree, a dark black, nodular liver weighing 2690 g, and a congested spleen weighing 1700 g. The second patient (26 yr old) was not jaundiced but was photosensitive. Their maternal grandfather had no liver disease but did have photosensitivity, and died at age 88 yr. The first sister exhibited BSP retention of 13.5% and slightly increased SGOT (43 U). Wedge biopsy and autopsy specimens showed an active cirrhosis with massive amounts of protoporphyrin in Kupffer cells, portal histiocytes, bile canaliculi and parenchymal cytoplasm. The second sister showed a small increase in BSP retention (11.7%) and SGOT (69 U). Needle biopsy showed portal inflammation with erosion of limiting plates, occasional bridging between triads and central areas of cell dropout. Protoporphyrin pigment was present in portal histiocytes, areas of central collapse, and, more rarely, in parenchymal cytoplasm. RBC and plasma protoporphyrin concentrations were markedly increased above normal in both cases. These data support previous observations that hepatic involvement may be an integral aspect of erythropoietic protoporphyria.

7593 HEPATIC GRANULOMAS CONTAINING COPPER IN WORKERS WHO TREAT GRAPES WITH COPPER SULFATE: A NEW TYPE OF HEPATIC GRANULOMA. *(Por.)* Pimental, J. C.; de Menezes, A. P. (Fac. Med., Lisbon, Portugal). *J. Med. (Oporto, Port.)* 87(1639):13-16, 1975.

Case reports are presented for 3 men, aged 51, 59, and 52 yr, resp., who developed copper-containing hepatic granulomas, associated with pulmonary lesions, after dusting grapes with copper sulfate for 3, 12, and 15 yr, resp. In the first case, hepatic granulomas were found only at autopsy; the patient died as a result of bilateral pneumothorax. Multiple pulmonary granulomas contained many inclusions of copper. The second patient, an alcoholic, was hospitalized with hepatomegaly, hypergammaglobulinemia, and hypoalbuminemia; turbidity tests were positive and SGOT and SGPT levels were increased. This patient died in a coma; autopsy showed micronodular cirrhosis, esophageal varices, and mild ascites. The third patient presented with hepatomegaly, hypergammaglobulinemia, and positive turbidity tests; SGOT, SGPT and alkaline phosphatase values were within normal limits. The patient responded to broad-spectrum antibiotics. Histological examination of a liver biopsy from this patient and autopsy of the first two patients showed that two types of granulomas were present in the liver: (1) rounded or oval nodules consisting of histiocytes and similar to granulomas found in the lungs of these patients, and (2) granulomas consisting of epithelioid cells organized into sarcoid-type follicles. Granulomas were accompanied by structures consisting of reticular fibers in all three patients. A few lymphocytes were detected inside of and around the granulomas. Cells forming these lesions contained varying numbers of fine granules which gave a positive reaction for copper with rubianic acid. Copper was also detected in focalized and diffusely proliferating Kupffer cells. Serial sections and 3-dimensional reconstructions of some areas of hepatic tissue demonstrated that granulomas and nodular, sclerohyaline scars were located in the portal spaces, while examination of isolated sections suggested that they were located between the lobules. In the patient with cirrhosis, granulomas were present in fibrous bands surrounding nodules of liver tissue.

7594 CLINICAL AND BIOCHEMICAL FEATURES OF HYPERTRIGLYCERIDEMIA IN LIVER DISEASE. *(Ger.)*

Linhart, P.; Kommerell, B.; Erbe, R.; Seidel, D. (Med. Clin. Univ. Heidelberg, Germany). *Inn. Med.* 9(2): 73-79, 1974.

To determine whether hypertriglyceridemia is the result of certain liver diseases or is associated with specific disorders in liver function, serum trigliceride levels were determined on 500 patients hospitalized with a variety of liver diseases and attempts were made to establish correlations between triglyceride levels and other liver function tests. Correlations significant on the 0.1% level were found between serum triglyceride concentrations and serum bilirubin concentrations and the presence or absence of lipoprotein-X. No correlations were observed between triglyceride concentrations and the Quick time. These findings suggest that increases in serum triglyceride concentrations in liver disease are due to cholestasis or increased serum bilirubin concentrations rather than to parenchymal liver damage. Fractionation of lipids in fasting blood samples from 32 patients, aged 19 to 66 yr, with acute hepatitis (27 cases), chronic hepatitis (three cases) and extrahepatic cholestasis (two cases) showed the presence of an abnormal, low-density lipoprotein (β_2-lipoprotein) in 15 cases. All of these 15 patients had hypertriglyceridemia. The abnormal lipoprotein differed from lipoprotein-X and from normal lipoproteins. It was never detected in blood from any of the ten patients who did not have hypertriglyceridemia. In most patients, this β_2-lipoprotein was associated with intra- or extrahepatic cholestasis, but it was not found in all patients with positive tests for lipoprotein-X. Although the absolute triglyceride content of the very low density lipoprotein (VLDL) fraction was slightly increased in most patients with the abnormal β_2-lipoprotein, the relative triglyceride concentration in the VLDL fraction was significantly decreased in all cases. This demonstrates that triglyceride-rich lipoproteins are present in the serum fraction having a density greater than 1.006 g/ml. It is suggested that the presence of the abnormal β_2-lipoprotein in fasting plasma from patients with liver disease and hypertriglyceridemia is due to decreased lipase activity in the liver since postheparin lipase activity, determined with either ^{14}C-trioleate or lipoprotein as the substrate, was significantly decreased in patients with the β_2-lipoprotein.

7595 IMMUNOGLOBULINS AND INFLAMMATORY LIVER DISEASES. *(Ger.)*

Bauch, K. (Kuchenwald Dist. Hosp. Clin., Karl Marx Stadt, Germany). *Z. Aerztl. Fortbild. (Jena)* 69(4):169-172, 1975.

Quantitative immunoglobulin determinations can be used in the diagnosis of acute hepatitis and primary biliary cirrhosis since these diseases are accompanied by characteristic changes in the immunoglobulin (Ig) pattern. However, immunoglobulin determinations are of no value in the diagnosis of chronic persistent and chronic aggressive hepatitis and cirrhosis. In general, increases in IgG are associated with inflammatory changes, while increases in IgA accompany fibrosis and pseudolobuli formation. There are conflicting opinions about the value of immunoglobulin determinations for establishing the prognosis of patients with liver disease. IgG and, to a lesser extent, IgA concentrations tend to decrease when patients with chronic liver disease are treated with immunosuppressive agents, but these changes are not necessarily correlated with clinical findings and are correlated with changes in histological findings in only one-half of all cases. Of serum turbidity tests (thymol turbidity test, Takata-Ara reaction, and zinc sulfate turbidity test), only the results from zinc sulfate turbidity test correlate with changes in the immunoglobulin pattern. No positive correlations were found between SGOT and SGPT values and immunoglobulin concentrations.

7596 THE DIFFERENTIAL DIAGNOSIS BETWEEN INTRAHEPATIC CHOLESTATIC JAUNDICE AND VIRAL HEPATITIS DURING PREGNANCY. *(E.)*

Piccinino, F.; Manzillo, G.; Sagnelli, E. (Faculta Medicina Universita Napoli, Via Cotugno 1, J-80135 Napoli/Italien). *Acta Hepato-Gastroenterol.* 22(3):144-150, 1975.

Clinical and laboratory findings from 15 patients with icteric viral hepatitis during pregnancy (VHP) and from 22 patients with intrahepatic cholestasis during pregnancy (CJP) were evaluated statistically to determine which parameters might help in differentiating between the two diseases. Diagnosis was established by needle liver biopsy in all cases. The following data were considered: history, physical examination, erythrocyte sedimentation rate (ESR), serum cholesterol, prothrombin time, total serum bilirubin, SGOT, SGPT, serum alkaline phosphatase, serum protein, serum flocculation tests, BSP blood clearance and serum hepatitis B antigen (HB Ag). Vomiting, high serum levels of GOT and GPT, and serum HB Ag positivity were correlated with VHP. A severe itching with scratching lesions, high ESR, elevated total cholesterol and serum alkaline phosphatase values were consistent with a diagnosis of CJP, especially when these symptoms occur in the later stage of pregnancy. On the basis of the clinical and biochemical data, a correct diagnosis was possible in only 11 of the 15 cases of VHP and in only 19 of the 22 cases of CJP. In the remaining seven cases, diagnosis could be established only on the basis of liver biopsy. Thus, while clinical and biochemical data are useful for a preliminary screening of patients with jaundice during pregnancy, diagnosis on this basis may be difficult in some cases and liver biopsy remains a simple means of obtaining a correct diagnosis.

7597 A STUDY OF TWO CASES OF INTRATHORACIC HEPATIC HETEROTOPIA.

(Fr.) Desvignes, G.; Mary, H.; Levasseur, P.; Aubert, A.; Petithomme, H.; Terrazas, G.; Thevenet, A.; Merlier, M. (Centre Chirurgical Marie-Lannelongue, 129, rue de Tolbiac, 75013 Paris). *Ann. Chir. Thorac. Cardio-vasc.* 14(2): 177-180, 1975.

Two cases of intrathoracic hepatic heterotopia were investigated in detail. Hepatic tissue ectopies were generally presented under two aspects: as a supernumerary lobe, or as a nodule included in the wall of other abdominal organs. In all cases they could be considered either as accessory livers or as ectopic lobes varying between 3 and 15 cm in diameter. The first patient had mixed thoraco-abdominal ectopy over and beneath the diaphragm; no biliary canal had been individualized. The second patient presented a more unusual case since the hepatic nodule was included in the pulmonary tissue of the inferior right lobe, creating a real intrapulmonary sequestration. These ectopic livers were vascularized by systemic arteries, stemming from either the aorta or normal hepatic arteries. The venous blood was always channeled to the inferior vena cava. In our first patient the thoracic hepatic ectopy was accompanied by a costo-vertebral anomaly. In the second patient a hepatic hernia from a Bochdalek foramen was present. These hepatic sequestrations were often hard to distinguish from the extralobar broncho-pulmonary ones. Excision is justified if the risk of cancer development is sufficiently great.

7598 EPIDEMIOLOGIC INVESTIGATION OF REYE SYNDROME.

(E.) Stechenberg, B. W.; Keating, J. P.; Koslov, S.; Schecter, M.; Chang, M.; Haymond, M. W.; Feigin, R. D. (St. Louis Children's Hospital, 500 S. Kingshighway, St. Louis, Mo. 63110). *J. of Pediatr.* 87(2):234-237, 1975.

A survey was made to determine the relation between Reye syndrome and viral illness in a community. Sera were collected five weeks apart from 136 classmates of patients with Reye syndrome. School attendance records were kept during the experimental period. Inactivated sera samples were tested for complement-fixing antibodies to adenovirus, influenza A, B, and C, parinfluenza I, II, and III, respiratory syncytial virus, and varicella. A four-fold change in titer was considered as an acute infection. As many as 81% of the children had evidence of recent infection with influenza B virus. SGOT and SGPT concentrations were normal. This report represents the first serologic study of school contacts of patients with Reye syndrome and strongly supports the concept that Reye syndrome may be related to a viral illness. The occurrence of Reye syndrome in an individual must reflect the difference in host response to these viral illnesses. The specific role of influenza B infection with Reye syndrome remains unclear.

7599 CLINICAL TRENDS AND TOPICS. REYE'S SYNDROME (ENCEPHALOPATHY AND FATTY LIVER): DIAGNOSIS AND TREATMENT.

(E.) Partin, J. C. (Children's Hosp. Research Foundation, Elland and Bethesda Ave., Cincinnati, Ohio 45229). *Gastroenterology* 69(2):511-518, 1975.

The clinical diagnosis and treatment of Reye's syndrome is reviewed. This condition is an acute encephalopathy which is associated with a panlobular microvesicular fatty liver. In untreated cases there is a progressive increase in brain swelling (edema), and an elevation of serum transaminases, plasma free fatty acids, blood ammonia, as well as a prolongation of prothrombin time. Liver glycogen falls, reaching a hypoglycemic state. The disease is consistently associated with a prodromal viral infection, attacking the patient within the first six years. The actual cause of the syndrome is unknown. The parenchyma of the liver and brain are injured simultaneously. Neurological signs range from lethargy, vomiting and headache to agitated delirium and coma. Liver biopsy is usually required, with fat stains recommended due to possible color loss in formalin and failure of H & E staining to reveal droplet accumulation. Mild cases are treated by correcting electrolyte balance with severe cases requiring peritoneal dialysis, intensive supportive care and continuous glucose infusion. Mannitol (1.5-2.0 g given over 15 min) every 6 hr is used to control cerebral edema. Corticosteroids are not used due to their production of gastrointestinal bleeding. The pathophysiology of this disease calls attention to the important interrelation between liver and brain functions.

7600 POSSIBLE PATHOGENIC ROLE OF ENDOTOXIN IN REYE'S SYNDROME.

(E.) Cooperstock, M. S.; Tucker, R. P.; Baublis, J. V. (Univ. Michigan Med. Cent., Ann Arbor). *Lancet* 1(7919):1272-1274, 1975.

The *Limulus* assay was used to investigate endotoxin-like activity in plasma and cerebrospinal fluid of 11 children with Reye's syndrome and in controls. Of 20 plasma samples from nine patients who became fully comatose in the first five days of central nervous system illness, the endotoxin-like activity ranged from 1-3000 ng/ml (mean, 30 ng/ml). Sequential studies were made of five of these patients. Declining levels were associated with clinical improvement in three, and in the two fatal cases endotoxin-like activity decreased only on appearance of ante-mortem EEG patterns (electrocerebral silence or near-silence). Endotoxin-like activity rose in one case for several days without clinical signs of relapse. Delirium and ataxia were observed in two patients, but they did not become comatose. Plasma endotoxin-like activity levels were 30 ng/ml and undetectable (less than 0.01 ng/ml), resp., during the first day of improvement in neurological symptoms. Plasma *Limulus* activity was not correlated with body temperature, levels of liver enzymes or platelet count. No significant hypotension was found. Endotoxin-like activity was significantly related to polymorphonuclear neutrophil count, and was also related to serum phosphorus depression. A prognostic significance was found for 14 EEGs done within 24 hr of the *Limulus* assay. A positive relation was found between plasma endotoxin-like activity and EEG abnormality in patients during the first four days of neurological symptoms who had not yet reached electrocerebral silence. Endotoxin-like activity was detected in two spinal fluid samples, one from a conscious patient (0.01 ng/ml) and the other from a comatose patient (1.0 mg/ml). The simultaneous plasma level was 300 ng/ml in the latter case. These results suggest that efforts to control intestinal flora in patients with acute reversible hepatic failure be directed towards anaerobic as well as aerobic flora.

7601 BILIARY BILE ACID COMPOSITION IN WILSON'S DISEASE. *(E.)* Cowen, A. E.; Korman, M. G.; Hofmann, A. F.; Goldstein, N. P. (Mayo Clinic, Rochester, Minn.). *Mayo Clin. Proc.* 50(5):229-233, 1975.

Biliary acid composition and hepatic function were studied in six patients, aged 15-24 yr, with Wilson's disease. The composition of bile obtained by duodenal tube following cholecystokinin stimulation and analyzed by thin-layer and gas chromatography was within normal limits. Total serum deoxycholyl conjugated was lowest in patients with severe liver involvement (as determined by biopsy conventional function tests and the rate of plasma clearance of i.v. injected cholyglycine at 5 uM/kg). The ratio of taurine to glycine conjugates was also normal in all subjects. It is concluded that biliary acid metabolism is normal in patients with Wilson's disease.

7602 LIPOLYSOSOMES IN HUMAN HEPATOCYTES: ULTRASTRUCTURAL AND CYTOCHEMICAL STUDIES OF PATIENTS WITH WILSON'S DISEASE. *(E.)* Hayashi, H.; Sternlieb, I. (Albert Einstein Coll. Medicine, Bronx, N.Y. 10461). *Lab. Invest.* 33(1):1-7, 1975.

Ultrastructural and cytochemical studies were undertaken to study the subcellular distribution of lipids in the livers of eight untreated and five D-penicillamine-treated patients with Wilson's disease. Liver biopsy specimens from these patients were examined by light and electron microscopy. Light microscopy revealed slight to severe fatty changes, fibrosis, mononuclear cell infiltrations, and/or occasional focal necrosis in seven specimens. Fatty changes were still evident in two of three patients after 4 to 16 yr of D-penicillamine therapy. Histochemical studies showed acid phosphatase reaction product around some of the lipid droplets in the specimens. Most of the lipid droplets in the hepatocytes appeared as homogeneous, electron-lucent vacuoles with or without a fine electron-dense layer at the periphery; there were no enveloping trilaminar unit membranes. Randomly distributed throughout the same hepatocytes were lipolysosomes, which accounted for 1 to 2% of the lipid droplets observed. They appeared as vacuoles surrounded by electron-dense material, the electron-dense periphery being of a tripartite nature. The lipolysosomes were also characterized by the presence of one or, rarely, two smooth, crescentic, nipple-like, or appendicular projections from their circumferences. These electron-dense projections were often composed of an amorphous, homogeneous matrix which contained the bulk of the acid phosphatase activity. In some lipolysosomes, stacked lamellae and vesicles with granular contents were seen in the electron-dense polar cap. No acid phosphatase reaction product was ever found within the lipid. The occurrence of lipolysosomes in a condition not known to be associated with an acid lipase deficiency suggests that lipolysosomes may represent a nonspecific, alternate route for the mobilization of excess lipid from hepatocytes.

7603 LIGATURE OF THE HEPATIC ARTERIES FOR METASTASES OF A CARCINOID TUMOUR. *(Fr.)* Chiche, B.; Morin, Y.; Marrai, O.; Carli, C. (Hosp. Cochin, Paris, France). *Nouv. Presse Med.* 4(17):1279-1281, 1975.

7604 THE USE OF WOFAVERDIN DYE IN THE STUDY OF HEPATIC BLOOD FLOW. *(Rus.)* Fomichev, V. I. (Moscow Med. Stomatol. Inst., USSR). *Klin. Med.* 53(1):71-73, 1975.

7605 BUDD-CHIARI SYNDROME ASSOCIATED WITH A PiS OR PiSO TYPE α_1-ANTITRYPSIN DEFICIENCY. *(Fr.)* Lammens, P.; Levy, V. G.; Martin, J. P.; Feldman, G.; Caroli, J. (CHU St. Antoine, 75012 Paris, France). *Med. Chir. Dig.* 3(6):409-415, 1974.

7606 HEPATIC VENOGRAPHY OF HEPATOMA. *(Jpn.)* Watanabe, T.; Hiramatsu, K.; Matsuyama, S.; Nagai, J.; Nishioka, K. (Keio University Medical School, Japan). *Rinsho Hoshasen (Jap. J. Clin. Rad.)* 20(2):119-125, 1975.

7607 PYOGENIC UNILOCULAR ABSCESS OF THE LIVER. *(Fr.)* Kayabali, I. (Faculty Medicine, Ankara, Turkey). *Lyon Chir.* 71(3):187-188, 1975.

7608 ASSESSMENT OF LIVER FUNCTIONS IN PATIENTS WITH HODGKIN'S DISEASE OBSERVED AT THE DEPARTMENT OF HAEMATOLOGY, INSTITUTE OF HAEMATOLOGY IN THE YEARS 1969-1973. *(Pol.)* Domanska, B. (Instytutu Hematologii w Warszawie, Poland). *Pol. Arch. Med. Wewn.* 53(3):231-240, 1975.

7609 LIVER DIAGNOSIS--CRUX MEDICORUM. *(Ger.)* Anonymous. (no affiliation given). *Diagnostik* 8(8):291-292, 1975.

7610 APPLIED BIOSTATISTICAL ANALYSIS IN THE EVALUATION OF THE PHYSIOPATHOLOGY OF SERUM ALCOHOL DEHYDROGENASE IN HEPATOPATHOLOGY: PRELIMINARY RESULTS. *(It.)* Di Simone, A.; Riegler, G.; Oriani, G. A.; Coltorti, M. (Fac. Med. Chir. I, Univ. Naples, Italy). *Boll. Soc. Ital. Biol. Sper.* 50(18): 1501-1504, 1974.

7611 ENDOSCOPIC CHOLANGIOGRAM AND INTRAVENOUS CHOLANGIOGRAM: AN ANALYSIS OF SIZE COMPARISON. *(E.)* Belsito, A. A.; Marta, J. B.; Dickinson, P. B.; Pizinger, R. J. (United Hosp., St. Paul, Minn.). *Gastroenterology* 68(4):1018, 1975.

7612 KALIKREIN-KININ AND RENIN-ANGIOTENSIN SYSTEMS IN HEPATORENAL (H.R.) SYNDROME. *(E.)* Wong, P. Y.; Talamo, R. C.; Colman, R. W.; Williams, G. H. (Albany Med. Coll., Albany, N.Y.). *Gastroenterology* 68(4):1014, 1975.

7613 NODULAR TRANSFORMATION (NT) OF THE LIVER AND INTRAHEPATIC HEMORRHAGE IN WOMEN ON ORAL CONTRACEPTIVES. *(E.)* Stauffer, J. Q.; Lapinski, M. W.; Honold, D. J.; Myers, J. K. (Upstate Med. Cent., Syracuse, N.Y.). *Gastroenterology* 68(4):991, 1975.

7614 ABNORMAL HEPATIC CHOLESTEROL METABOLISM IN HYPERLIPIDEMIA. *(E.)* Salen, G.; Hicolau, G.; Shefer, S.; Mosbach, E. H. (VA Hosp., East Orange, N.J.). *Gastroenterology* 68(4):978, 1975.

7615 UREA PRODUCTION AFTER PROTEIN LOADING. *(E.)* Rafoth, R.; Onstad, G. (VA Hosp., Minneapolis, Minn.). *Gastroenterology* 68(4):969, 1975.

7616 HEPATOMA AFTER THOROTRAST. *(E.)* Mann, N. S.; Chaudhry, A.; Thaller, S.; Sachdev, A. (Univ. Louisville Sch. Med., Louisville, Ky.). *Gastroenterology* 68(4):945, 1975.

7617 COMBINED SURGERY AND CHEMOTHERAPY IN THE TREATMENT OF PRIMARY AND SECONDARY TUMORS OF THE LIVER. *(Fr.)* Pettavel, J.; Morgenthaler, F. R. (Surgery Dept., Univ. Lausanne, Lausanne, Switzerland). *Schweiz. Med. Wochenschr.* 105(18):596-598, 1975.

7618 THE SIGNIFICANCE OF VARIATIONS IN SOME HEMATOCHEMICAL CONSTANTS IN THE DIAGNOSIS OF HEPATIC METASTASES. *(It.)* Sianesi, M.; Lampugnani, R. (Istituto Patologia Speciale Chirurgica Propedeutica Clinica, Universita Parma, Parma, Italy). *Chir. Patol. Sper.* 22(4):239-254, 1974.

7619 CLINICAL SIGNIFICANCE OF THE DETERMINATION OF FREE BILE ACIDS IN SOME HEPATOBILIARY DISEASES. *(Rus.)* Abramzon, M. A.; Popova, R. A.; Ripatti, P. O. (Medical Faculty, Petrozavodsk Univ., Petrozavodsk, USSR). *Vrach. Delo* (3):72-74, 1975.

7620 HEPATIC ANGIOMA: A CASE OF CAVERNOUS HEMANGIOMA OF THE LIVER IN A BABY GIRL AGED 36 DAYS WHO UNDERWENT AN EMERGENCY OPERATION FOR LEFT LATERAL LOBECTOMY. *(It.)* Gullino, D.; Bianco, G.; Cardino, L.; Giaccardi, A. (Ospedale Maggiore SS. Annunziata, Savigliano, Italy). *Chir. Gastroenterol.* 8(3):342-356, 1974.

7621 THE PATHOGENESIS OF VARIOUS ANATOMICAL AND CLINICAL FORMS OF INTRAHEPATIC CHOLESTASIS. *(It.)* Teodori, U.; Gentilini, P. (Inst. Clinica Medica Generale, Univ. Florence, Florence, Italy). *Arch. "De Vecchi" Anat. Patol. Med. Clin.* 58(1-2-3): 177-211, 1973.

7622 CHARACTERISTICS OF ARTERIOGRAPHY OF THE LIVER IN METASTASIZED LIVER TUMOR. *(Jpn.)* Tsujii, H.; Suzaki, K.; Moriya, H.; Sato, S.; Irie, G. (Sapporo Natl. Hosp., Sapporo, Japan). *Rinsho Hoshasen* 19(9):667-675, 1974.

7623 GIANT VASCULAR TUMOR OF THE LIVER. *(Jpn.)* Tsushima, K.; Tsuchida, H.; Yamagata, N.; Kumakura, N.; Chiba, H.; Sasamura, M.; Ichimura, H.; Abe, F.; Kakizaki, Y.; Tomita, S. (Hirosaki National Hosp., Hirosaki, Japan). *Rinsho Hoshasen* 19(11): 871-876, 1974.

7624 THERAPEUTIC STUDY OF A NEW HEPATOPROTECTIVE AGENT: CONIFERYL POLYHYDROXY-2-PHENYLCHROMANONE. *(Fr.)* Plomteux, G.; Defrance, P.; Delforge, M.; Crismer, R. (Univ. Hosp. Center, Liege, Belgium). *Ann. Gastroenterol. Hepatol.* 10(6):533-541, 1974.

7625 PRIMARY MESENCHYMOMA OF THE LIVER. ULTRASTRUCTURAL STUDY. *(Fr.)* Lagace, R.; Delage, C.; Robert, J. (Dept. d'Anatomie Pathologique, Hotel-Dieu de Quebec, 11 Cote du Palais, Quebec, G1R 2J6, Canada). *Ann. Anat. Pathol. (Paris)* 19(3):275-286, 1974.

7626 COMPARISON OF THE PHARMACOKINETICS OF THE COMBINATION TRIMETHOPRIM + SULFAMETHOXAZOL IN LIVER PATIENTS AND NORMAL SUBJECTS. *(Ger.)* Rieder, J.; Schwartz, D. E. (Abteilung Fur Experimentelle Medizin, F. Hoffmann-La Roche & Co., Basel, Switzerland). *Arzneim. Forsch.* 25(4):656-666, 1975.

7627 INFANTILE MESENCHYMAL HAMARTOMA OF THE LIVER. HISTOLOGIC AND ULTRASTRUCTURAL OBSERVATIONS. *(E.)* Dehner, L. P.; Ewing, S. L.; Sumner, H. W. (Washington Univ. Sch. Medicine, St. Louis, Mo. 63130). *Arch. Pathol.* 99(7):379-382, 1975.

7628 HOW THE LIVER METABOLIZES FOREIGN SUBSTANCES. *(E.)* Kappas, A.; Alvares, A. P. (no affiliation given). *Sci. Am.* 232(6):22-31, 1975.

7629 CLINICAL AND EXPERIMENTAL LIVER GRAFTING. *(E.)* Calne, R. Y. (Dept. Surgery, Univ. Cambridge, Cambridge, England). *Guy's Hosp. Rep.* 123(1):1-12, 1974.

7630 INTRAOPERATIVE PHYSIOLOGIC MONITORING AND MANAGEMENT DURING HEPATIC LOBECTOMY USING THE LIVER ISOLATION-PERFUSION TECHNIC. *(E.)* Howland, W. S.; Schweizer, O.; Fortner, J. G.; Shiu, M. H.; Ragasa, J. P.; Wightman, A. E.; Gould, P. (Memorial Sloan-Kettering Cancer Center, New York, N.Y. 10021). *Am. J. Surg.* 129(6):608-615, 1975.

7631 PRIMARY MALIGNANT LIVER TUMORS IN INFANCY AND CHILDHOOD. REPORT OF 12 CASES. *(E.)* Han Mao-t'ang; Fang Chic-ch'in; Ho Hui-chen; Fang Shih-hsun; Fang Tsung-chih; Sun Ts'ui-yun. (Tientsin Children's Hosp., Tientsin, China). *Chin. Med. J.* (11):194, 1974.

7632 SOME IMMUNOLOGICAL ASPECTS OF LIVER FUNCTION. *(E.)* Triger, D. R. (Univ. Southampton Medical Sch., Hampshire, England). *Yale J. Biol. Med.* 48:47-54, 1975.

See also, 6827, 6836, 6986, 6992, 7003, 7006, 7011, 7016, 7018, 7020, 7024, 7025, 7029, 7031, 7032, 7038, 7044, 7045, 7046, 7053, 7062, 7063, 7066, 7322, 7530, 7532, 7685, 7745, 7752, 7755, 7756, 7761, 7770, 7784, 7794, 7942, 7946, 7947, 7948, 7949, 7953, 7954, 7955, 7959, 7965, 7966, 7967, 7969.

LIVER AND BILIARY TRACT

Hyperbilirubinemic States

7633 NEONATAL HYPERBILIRUBINEMIA FOLLOWING THE USE OF OXYTOCIN IN LABOUR. *(E.)* Beazley, J. M.; Alderman, B. (Dept. Obstetrics Gynaecology, Univ. Liverpool, England). *Br. J. Obstet. Gynaecol.* 82(4):265-271, 1975.

A prospective study was made to determine the association of administration of oxytocin to women during labor and the subsequent occurrence of neonatal hyperbilirubinemia. Of 1393 consecutive patients initially studied, 40 were excluded because of the low birth weight (< 2.5 kg) of the babies. The remaining 1353 women were classified into three categories: 1) spontaneous labor (687); 2) spontaneous labor subsequently accelerated with oxytocin (149 of the first group); and 3) labor induced by forewater amniotomy and simultaneous i.v. oxytocin (666). No significant difference was seen in the mean bilirubin concentrations of infants born after induced or spontaneous labors. Women whose infants developed hyperbilirubinemia received a significantly higher mean total dose of oxytocin than women whose babies were not affected. In addition, the influence of oxytocin on subsequent hyperbilirubinemia was found to be dose-dependent. The incidence of the disease rose sharply when the total dose of the drug exceeded 20 U (12% of induced labors in this study). The incidence was also found to increase as the duration of induced labor increased. No similar relation was seen between the disease incidence and the duration of spontaneous labor. These results confirm that an association exists between the use of oxytocin in labor and neonatal hyperbilirubinemia. Low birth weight, duration of labor and method of feeding were eliminated as significant etiological factors.

7634 GROWTH HORMONE AND CORTISOL IN NEONATES DURING PHOTOTHERAPY. *(E.)* von Muhlendahl, K. E.; Ballowitz, L. (Univ. Kinderklinik, Freie Universitat, D-1000, Berlin 19, Heubnerweg 6, Germany). *Z. Kinderheilkd.* 119(1):53-58, 1975.

The effect of phototherapy on plasma growth hormone (GH) and cortisol levels in 22 neonates with hyperbilirubinemia was studied. GH values in healthy, full-term infants were elevated, as compared to older children and adults, during the entire neonatal period of this study. They demonstrated a slight rise on the second day, followed by a slow decline during the following days. Mean cortisol levels in these infants were lower than what would be expected as normal morning cortisol plasma concentrations in older children or adults. There was a lack of correlation between bilirubin and GH levels. There was also no correlation in the children subjected to phototherapy. Cortisol values were also unrelated to the degree of hyperbilirubinemia. During phototherapy most children had GH levels significantly higher than the healthy infants. There was also a significant difference in the levels during phototherapy and those recorded before or after treatment. This effect, however, was not seen in all children. In six neonates, GH failed to increase during therapy. Cortisol concentrations were not significantly higher during treatment than before or after phototherapy. Differences between infants undergoing phototherapy and controls also were not significant. There was no correlation between GH and cortisol plasma levels. This study demonstrates that phototherapy in hyperbilirubinemic infants raises plasma GH concentrations, but does not alter cortisol levels. The mechanisms by which such treatment induces increases in GH are not evident. However, there might be some connection with the constant covering of the eyes, which abolishes the day-night rhythm, or other environmental alterations that are necessitated by the treatment apparatus.

7635 DUBIN-JOHNSON SYNDROME: A REPORT OF THE FIRST CASE AMONG CHILDREN THAT OCCURRED IN CUBA. *(Sp.)* Estrada Rodriguez, M.; Alverez Carrazana, L. (Prov. Pediatr. Hosp., Camaguey, Cuba). *Rev. Cubana Pediatr.* 46(6):627-636, 1974.

7636 ATYPICAL MITOCHONDRIA OBSERVED IN HEPATOCYTES OF ROTOR'S DISEASE. *(E.)* Kobayashi, T.; Fujita, K.; Yamada, G.; Kosaka, K. (Kawasaki Hosp., Okayama, Japan). *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3-4):357, 1974.

7637 INQUIRY INTO THE ETIOLOGY OF NEONATAL JAUNDICE IN ABIDJAN. *(Fr.)* Badoual, J.; Assi Adou, J.; Essoh Nomel, P.; Kangah, D. (Enquete sur l'etiologie des icteres du nouveau-ne`a Abidjan, Ivory Coast). *Ann. Pediatr.* 21(10):687-692, 1974.

See also, 7766.

LIVER AND BILIARY TRACT

Nonviral Hepatitis and Hepatic Injury

7638 ULTRASTRUCTURE OF THE LIVER IN HUMAN BRUCELLOSIS. *(Pol.)* Biczysko, W.; Juszczyk, J.; Blotna, M.; Kivzka, W. (Acad. Med., Poznan, Poland). *Pol. Arch. Med. Wewn.* 53(3):219-229, 1975.

Ultrastructural changes in liver of 25 patients with diagnosed brucellosis (one case in the acute stage, the rest with chronic disease), aged 33-65 yr, were studied by electron microscopy. The following were observed: in the acute stage of the disease, lysis of isolated liver cells, lymphocyte infiltrations in hepatic lobules, and epithelial cell infiltrates in the porto-biliary spaces; in the chronic stage, fatty infiltrations and bile stasis and signs of fibrosis of varying intensity were associated with lymphocyte infiltrations.

7639 ASPIRIN-INDUCED HEPATOTOXICITY IN JUVENILE RHEUMATOID ARTHRITIS: A PROSPECTIVE STUDY. *(E.)* Athreyz, B. H.; Moser, G.; Cecil, H. S.; Myers, A. R. (Children's Seashore House, 4100 Atlantic Ave., Atlantic City, N. J. 08401). *Arthritis and Rheumatism* 18(4):347-352, 1975.

In an effort to study salicylate-induced liver damage, a follow-up study was made of 42 children receiving aspirin therapy. Diagnoses in this patient population consisted of juvenile rheumatoid arthritis (34), acute cartilagenous necrosis of the hip following slipped capital femoral epiphysis (six), and ulcerative colitis and hip disease (two). The patients had received aspirin therapy over a period of one to 27 months. Serial determinations of SGOT, SGPT, lactic dehydrogenase, alkaline phosphatase, bilirubin, and serum salicylate were made. In 14 cases prothrombin time was measured. Twenty-two of the rheumatoid arthritis patients but none of the eight controls demonstrated abnormalities of various liver functions at serum salicylate levels between 7.0 and 43 mg%. Marked elevations of SGOT, SGPT, lactate dehydrogenase, and alkaline phosphatase were observed in three children who also demonstrated prolongation of prothrombin time and epistaxis. This type of reaction occurred within five to 14 days of the initiation of aspirin therapy. It occurred at serum salicylate levels between 18 and 43 mg%. In 19 other children, moderate changes in various liver function tests were noted. None of the other children showed prolongation of prothrombin time. The serum salicylate level in this group varied between 7.0 and 38.2 mg%. In six children, the liver function tests returned to normal after removal of the aspirin. In 12 others, the functions normalized even with continued aspirin therapy. The results of this study suggest that it is not necessary to discontinue salicylate therapy, except in those children who develop bleeding.

7640 ISONIAZID-ASSOCIATED HEPATITIS IN 114 PATIENTS. *(Eng.)* Black, M.; Mitchell, J. R.; Zimmerman, H. J.; Ishak, K. G.; Epler, G. R. (Nat. Heart and Lung Inst., Building 10, Room 8N-115, Bethesda, Md. 20014). *Gastroenterology* 69(2):289-302, 1975.

The nature of the apparent isoniazid-induced hepatic injury in 114 patients taking 300 mg of the drug daily for chemoprophylaxis of tuberculosis was studied. The clinical features in the 66 hospitalized patients consisted primarily of: gastrointestinal complaints in 55% of the cases, hepatomegaly with variable degrees of abdominal tenderness was present in 33% and jaundice was the presenting complaint in 10%. Marked hyperbilirubinemia was seen in 25% of the patients and was generally associated with a poor prognosis; alkaline phosphatase activity and the levels of SGOT and SGPT were elevated in 92% of the patients in whom it was measured; prothrombin time values were abnormal in 20 of 54 patients; serum cholesterol levels were elevated in 29 of 48 and were below normal in five; and lactic dehydrogenase was elevated in 47 of 63 patients. Sections of hepatic tissue showed hepatocellular injury in 32 of 33 patients; the histologic pattern showed submassive necrosis in nine, massive necrosis in four, moderately severe acute hepatocellular injury in 16, and chronic hepatic disease in one. The inflammatory response in all these categories was similar, consisting mainly of lymphocytes and plasma cells with relatively few eosinophils and neutrophils. Most of the patients were between 40 and 60 years old, and hepatic injury was recognized in 15% during the first month of isoniazid administration, during the second month in 31%, and in 54% between the second and eleventh months. Thirteen of the 114 patients died. Hepatic injury presenting after 2 mo, especially with bilirubin levels exceeding 20 mg/100 ml, was more likely to have a fatal outcome than disease presenting during the first 2 mo, even with high bilirubin levels. The fatality rate was significantly higher in black females than in black males or in whites of either sex. The data offer no support for the view that isoniazid-induced hepatic disease results from hypersensitivity to the drug, but they do suggest that hepatotoxic metabolites of the drug may be responsible for the injury.

7641 ISONIAZID-ASSOCIATED HEPATITIS: RECONSIDERATION OF THE INDICATIONS FOR ADMINISTRATION OF ISONIAZID. *(E.)* Israel, H. L. (Jefferson Medical Coll., Philadelphia, Pa. 19107). *Gastroenterology* 69(2):539-542, 1975.

The use of isoniazid as a means of preventing activation of previously acquired tuberculosis infection has been advocated by public health physicians. This recommendation was carried out because isoniazid prophylaxis seemed effective, inexpensive, and safe. The discovery that isoniazid could induce liver damage has been met with slow acceptance among those working in the tuberculosis field. At a 1974 conference of the Tuberculosis Advisory Committee at the Center for Disease Control, it was concluded that the use of isoniazid as a preventative was justified regardless of patient age, despite a hepatitis risk of 2-3% over the age of 50, if the tuberculin reactor was a member of a household with recently diagnosed tuberculosis, had chest x-ray findings consistent with stable tuberculous lesions, had been recently infected, was receiving prolonged adrenocortico- or immunosuppressive therapy, or had leukemia, Hodgkin's disease, diabetes mellitus, silicosis, or a gastrectomy. A new and disturbing feature of studies dealing with hepatitis incidence among isoniazid users is the frequency of fatal hepatitis. Such findings have important implications for the further use of this medicine. An alternative approach in drug prophylaxis of tuberculosis would be the use of other chemotherapeutic agents. It is suggested that the use of isoniazid be restricted to patients with pulmonary and extrapulmonary tuberculosis in whom the diagnosis was confirmed by cultural demonstration of mycobacteria. Therapy for suspected tuberculosis is justified only in the critically ill. It is difficult to justify prophylactic use of a potentially fatal drug.

7642 LIVER DAMAGE THROUGH OXYPHENISATIN CONTAINING LAXATIVES. *(Fl.)* Bras, G.; Bronkhorst, F. B.; Haneveld, G. T.; Lourens, J. (Inst. Pathology, State Univ., Utrecht, The Netherlands). *Ned. Tijdschr. Geneeskd.* 117(40):1501-1504, 1973.

Chronic aggressive hepatitis with lobular involvement was diagnosed by clinical, biochemical, and histological examinations in a 67-yr-old female patient. The patient admitted to have taken an oxyphenisatin-containing laxative daily for about two years. Rapid normalization of the general health status and of the biochemical parameters after stopping the use of the drug was observed. The findings indicate the hepatotoxic effect of oxyphenisatin. For this reason, the sale of drugs containing oxyphenisatin has been banned in several countries.

7643 CHOLOSTATIC JAUNDICE FOLLOWING DISSEMINATED INTRAVASCULAR COAGULATION ("SHOCK-LIVER"). *(Ger.)* Kunzer, W.; Sutor, A. H.; Niederhoff, H.; Kunzer, Jr., W. (Univ. Freiberg, Child. Clin., Freiberg, Germany). *Klin. Wochenschr.* 53(9):441-443, 1975.

7644 THE FUNCTION OF THE HEPATO-BILIARY SYSTEM AFTER THE ACUTE INTOXICATION WITH POLYCHLOROPINENE. *(Rus.)* Bezugly, V. P.; Kaskevich, L. M.; Ovsiannikova, L. M. (Inst. Hygiene, Toxicology, Pesticides, Polymers, and Plastics, Kiev, USSR). *Gig. Tr. Prof. Zabol.* 19(2):52-54, 1975.

See also, 7002, 7308.

LIVER AND BILIARY TRACT

Acute Viral Hepatitis

7645 FUNCTIONAL SULFOBROMOPHTHALEIN TEST IN THE EVALUATION OF SHORT-TERM OUTCOME OF VIRAL HEPATITIS. *(Rus.)* Sorinson, S. N.; Kuksenkov, E. S. (S. M. Kirov Medical Inst., Gorky, USSR). *Ter. Arkh.* 46(4):68-71, 1974.

A BSP test was used for the determination and characterization of phenomena following viral hepatitis. The study was performed on 204 patients with viral hepatitis (172 cases of infectious, and 32 cases of serum hepatitis), 25 patients with primary hyperbilirubinemia, seven patients with chronic hepatitis, and a control group of ten persons. The ages of patients varied between 20 and 60 yr. BSP was introduced i.v. (5 mg/kg); its content in the blood of the patients was determined spectrophotometrically with samples taken 3 and 45 min after the i.v. introduction; in urine, samples were taken 2, 4, and 6 hr after i.v. introduction. Results showed very definitely that in proportion to the weakening of jaundice and in the post-jaundice period for the majority of patients, the indexes of the BSP test showed significant changes. The following percentages of the retained BSP in the blood were retained for each particular group of patients: for patients with no signs of hepatitis, 4.6%; for patients with post-hepatic bilirubinemia, 3.2%; for patients with hepatomegaly, 7.0%; for patients with dyscrasia of the bile ducts, 12.3%; and for patients with noncurable hepatitis, 21.1%. The results of urine analysis showed just the opposite behavior; in proportion to the dissipation of the signs of jaundice, the content of BSP excreted in the urine decreased.

7646 THE DETECTION OF HEPATITIS B ANTIGEN IN HEPATIC PARENCHYMA BY THE FLUORESCENT ANTIBODY TECHNIC.

(E.) Orr, W. (Dept. Pathology, Univ. Manitoba, 770 Bannatyne Ave., Winnipeg 3, Manitoba, Canada). *Am. J. Clin. Pathol.* 64(2):257-262, 1975.

The fluorescent antibody technique was applied to the detection of hepatitis B antigen (HBAg) in 42 specimens of liver tissue from patients with a variety of liver diseases. Twelve of the 42 samples were from HBAg-seropositive patients whose diagnoses included acute viral hepatitis (seven), chronic persistent hepatitis (one), chronic aggressive hepatitis (two), cryptogenic cirrhosis (one), and hemosiderosis (one). The other 30 tissue samples were from HBAg-seronegative patients diagnosed as having acute viral hepatitis (five), chronic persistent hepatitis (three), chronic aggressive hepatitis (two), primary biliary cirrhosis (two), cryptogenic cirrhosis (two), alcoholic hepatitis (three), alcoholic cirrhosis (three), normal liver (two), hemosiderosis (one), secondary biliary cirrhosis (one), intrahepatic biliary atresia (one), idiopathic recurrent cholestasis (one), Wilson's disease (one), extrahepatic biliary obstruction (one), nonspecific reactive hepatitis (one), and passive congestion (one). In four seropositive patients, fluorescence was cytoplasmic in location when stained with commercial rabbit antisera. Nuclear fluorescence was noted in one case reexamined with a human antiserum. In these patients, round intranuclear virus-like particles with a slightly angular profile, measuring about 20 mm in diameter, were found by electron microscopy. These patients all had chronic aggressive hepatitis or active cirrhosis, and all were receiving immunosuppressive therapy. This study has shown an inverse relation between the intensity of liver-cell injury and the presence of HBAg or nuclear particles in hepatic parenchymal cells in HBAg-seropositive patients. These data are consistent with the hypothesis that viral hepatitis B represents a cellular immunologic attack on viruses and on liver cells that have been altered by the incorporation of viral antigens into their cell membranes. When competent, the immune response eliminates both types of attack, and acute viral hepatitis results. When the immune response is deficient or suppressed, the outcome is chronic hepatitis.

7647 HEPATITIS B SURFACE ANTIGEN (HB$_s$Ag) SUBTYPES AND INDICES OF CLINICAL DISEASE.

(E.) Gerety, R. J.; Hoofnagle, J. H.; Nortman, D. F.; Barker, L. F. (Bureau Biologics, Food Drug Admin., 8800 Rockville Pike, Bethesda, Md. 20014). *Gastroenterology* 68(5):1253-1260, 1975.

The possibility that infection with different subtypes of the hepatitis B surface antigen (HB$_s$Ag) may result in cases of hepatitis with different clinical features and outcomes was investigated. Of 190 patients exposed to a common icterogenic plasma pool or one of its infectious derivatives, 111 developed HB$_s$Ag detectable by radioimmunoassay, 75 of which circulated HB$_s$Ag detectable by counterelectrophoresis. Of these, 74 could be subtyped by counterelectrophoresis, rheophoresis, or agar gel diffusion. Of these, 50 were subtype *adw*, 22 *ayw*, and two were *adyw* (these last were excluded from study). The incubation period was shorter among *adw* than *ayw* cases by an average of 10-12 days. These differences were highly significant ($P < 0.05$) only for incubation period as measured from the date of exposure to the plasma pool to the measurement of HB$_s$Ag appearance by both radioimmunoassay and counterelectrophoresis. For most disease indices, *adw* cases appeared to be more severe, but there was considerable overlap between the two groups, the average differences were small, and there was no significant difference between them. The chronic carrier state developed in 16.0% of *adw* cases and in 9.1% of *ayw* cases, which was not significantly different. No statistically significant difference was seen between *adw* and *ayw* cases for any index of residual disease analyzed. These data indicate that HB$_s$Ag subtypes *d* and *y* do not correlate with the clinical manifestations or outcome of hepatitis B virus infection.

7648 HEPATITIS B SURFACE ANTIGEN IN SALIVA OF HB$_s$Ag CARRIERS.

(E.) Feinman, S. V.; Krassnitski, O.; Sinclair, J. C.; Wrobel, D. M.; Berris, B. (Mount Sinai Hosp., Univ. Toronto, Canada). *J. Lab. Clin. Med.* 85(6):1042-1048, 1975.

Saliva from a large number of adult asymptomatic hepatitis B surface antigen (HB$_s$Ag) carriers and normal controls was tested for the presence of HB$_s$Ag. Several techniques were used to study 212 saliva specimens from 112 carriers. Crossover immunoelectrophoresis with four different antisera and normal human plasma was used to test 66 specimens from 63 carriers. Radioimmunoassay after dialysis and concentration against polyvinyl pyrolidine was used to test 58 of these (Group A). Radioimmunoassay after passage through a Celite filter, followed by dialysis and 60x concentration against polyvinyl pyrolidine, was used with 87 samples from 60 carriers (Group B). The presence of the antigen in 59 saliva samples from 51 carriers was investigated by radioimmunoassay after passage through a Celite filter and 30x concentration against polyethylene glycol (Group C).

These samples were also tested by crossover immunoelectrophoresis using only one antiserum. The last group (Group D) included 44 samples from 44 antigen- and antibody-negative controls, applying the same methods as used for Group C. Crossover immunoelectrophoresis detected HB_sAg in 66 samples from Group A (6%) and 59 from Group C (16%). Radioimmunoassay detected the antigen in 37% of samples from Group A, 16% of Group B (87 specimens), and in 78% of Group C samples. Of six saliva specimens collected at different times from one antigen carrier, but processed and tested the same way (Group B), two were positive and four were negative for the antigen. It is suggested that the presence of HB_sAg in saliva may indicate that saliva is important in the spread of infection.

7649 CELL-MEDIATED IMMUNITY TO HEPATITIS B SURFACE ANTIGEN IN BLOOD DONORS WITH PERSISTENT ANTIGENAEMIA. *(E.)* Lee, W. M.; Reed, W. D.; Mitchell, C. G.; Woolf, I. L.; Dymock, I. W.; Eddleston, A. L. W. F.; Williams, R. (King's Coll. Hosp. Med. Sch., London, England). *Gut* 16(6):416-420, 1975.

Cellular immunity to the hepatitis B surface antigen (HB_sAg) was examined in blood donors who were carriers of the antigen, some with liver biopsy abnormalities of varying severity, using the leukocyte migration test. The subjects were also tested for sensitization to the liver-specific membrane lipoprotein. All 38 subjects had HB_sAg detectable in serum by immunodiffusion or electrophoresis, and all were asymptomatic. Elevated serum aspartate aminotransferase levels were found in 15, ranging from 44-247 IU/liter. Liver biopsies were performed in 10 of the 38 and in seven of the 15 with abnormal enzyme levels. Inhibition of leukocyte migration with HB_sAg was found in 10 (26%) of the 38. Of 23 cases with normal enzyme levels, only three (13%) showed migration inhibition, while inhibition of migration was present in seven (47%) of the 15 with abnormal enzyme levels. This difference was statistically significant. Of nine cases with unrelated changes or focal necrosis on liver biopsy, only one (11%) showed cellular immunity to HB_sAg, compared with three (38%) of eight cases with chronic persistent or chronic aggressive hepatitis. Inhibition of migration by the liver-specific lipoprotein was seen in seven (78%) of nine tested patients with abnormal enzyme levels, in none of seven with normal enzyme levels, and in six (75%) of eight with hepatitis. Two subjects with unrelated histological changes had normal migration indices, and only one of four with focal parenchymal necrosis showed lipoprotein sensitization. This study supports the hypothesis that a T-lymphocyte response to HB_sAg can initiate an autoimmune reaction to liver-specific lipoprotein, and that this reaction may be of importance in the pathogenesis of liver damage. In the absence of the T-cell response, there would be no autoimmune reaction and no liver damage.

7650 CELL-MEDIATED IMMUNE REACTIVITY TO HEPATITIS B SURFACE ANTIGEN IN LIVER DISEASE. *(E.)* De Moura, M. C.; Vernace, S. J.; Paronetto, F. (Mount Sinai Sch. Medicine, City Univ. New York, New York, N. Y). *Gastroenterology* 69(2): 310-317, 1975.

Using a purified preparation of hepatitis B surface antigen (HB_sAg) and the leucocyte migration agarose test, the cellular immune reactivity to HB_sAg was studied in 57 patients with liver diseases. The patient population included nine patients with HB_sAg-positive acute viral hepatitis (AVH), five recovering from HB_sAg-positive AVH, 27 with chronic hepatitis and 21 patients with miscellaneous liver diseases including alcoholic cirrhosis (11), primary biliary cirrhosis (four), extrahepatic biliary obstruction (four), drug-induced hepatitis (one) and recurrent benign cholestasis (one). In all nine patients in the acute phase of viral hepatitis, inhibition of leucocyte migration by HB_sAg was noted. This was not found during convalescence. In only one of 15 patients with chronic persistent hepatitis did HB_sAg inhibit migration of leukocytes. Such inhibition was not noted in any of the 16 with chronic periportal hepatitis, and in only two of 21 with nonhepatic liver diseases. In a group of 16 normal patients studied as controls, inhibition of migration was found in only one, a physician, exposed to HB_sAg. Using HB_sAg-positive serum as antigen gave similar, but not identical, results. No correlation could be determined between reactivity to HB_sAg and the presence of autoantibodies or anti-HB_s in patients with chronic hepatitis. This study suggests that a reactivity to HB_sAg in patients with acute viral hepatitis may indicate clearing of the antigen, whereas in patients with chronic hepatitis it may reflect a state of specific tolerance to this antigen. Additional studies using other preparations of antigens associated with hepatitis B virus are needed to clarify the role of cell-mediated immunity to hepatitis B virus in acute and chronic liver diseases.

7651 TREATMENT OF ACUTE LIVER FAILURE DUE TO HEPATITIS B (HB) VIRUS WITH PLASMA CONTAINING ANTIBODIES FOR HB. *(Ger.)* Bolte, J. P.; Meyer zum Buschenfelde, K. H.; Knolle, J. (2nd Med. Clin., Johannes Gutenberg Univ., Mainz, Germany). *Inn. Med.* 1(2):63-72, 1974.

Case reports are presented for six patients (four women and two men, aged 22-49 yr) with HBAg-positive hepatitis and hepatic coma (four in stage IV and two in stage II) who were treated with plasma containing antibodies for HB (HBAb: 2-7 doses of 150-200 ml over 1-4 days) in combination with large doses of hydrocortisone (200-300 mg/day in five cases; 1200 mg/day in one case). Of these six patients, four recovered and became HBAg-negative and two women died. One was a 49-yr-old patient who had taken a laxative containing 5 mg diacetyldiphenolisatin every day. She died of circulatory failure; two bleeding gastric ulcers were found at autopsy. The other patient who died was 9 months pregnant and developed intestinal bleeding with terminal intravascular clotting. To be effective, plasma containing HBAg must be administered early. To obtain more information about the effectiveness of treating fulminating liver failure with plasma containing HBAb and corticosteroids, a controlled study must be performed using large doses of cortisone alone.

7652 SERUM IMMUNOGLOBULIN CONTENT IN INFECTIOUS AND SERUM HEPATITIS. *(Rus.)* Cherednichenko, T. V.; Petrunin, Y. A. (N. I. Pirogov 2nd Moscow Medical Inst., USSR). *Vopr. Okhr. Materin. Det.* 20(3):11-14, 1975.

7653 SERUM PROTEIN SPECTRUM ACCORDING TO DATA FROM POLYACRYLAMIDE GEL DISC-ELECTROPHORESIS IN CHILDREN WITH VIRAL HEPATITIS. *(Rus.)* Bragin, V. P. (Leningrad Medical Inst. Sanitation Hygiene, USSR). *Vopr. Okhr. Materin. Det.* 20(3):7-11, 1975.

7654 VIRAL HEPATITIS. REPORT OF A WHO MEETING. *(E.)* Anonymous. (World Health Organization). *Geneva, World Health Organization,* 1975, 49 pp.

7655 ADVANCES IN HEPATITIS B-ASSOCIATED ANTIGEN (HB Ag). *(Fr.)* Soulier, J. P. (No affiliation given). *Rev. Fr. Gastroenterol.* (102):23-24, 27-28, 32, 1974.

7656 FREQUENCY OF AUSTRALIA ANTIGEN IN SOME ACUTE AND CHRONIC LIVER DISEASES. *(It.)* Perpignano, G.; Demelia, L.; Argiolas, N. (Istituto di Patologia Speciale Medica, Univ. di Cagliari, Cagliari, Italy). *Rass. Med. Sarda* 26(2):169-177, 1974.

7657 EDEMATOUS HEPATITIS: A SPECIAL FORM OF ACUTE VIRUS HEPATITIS WITH SECONDARY ALDOSTERONISM. *(Ger.)* Kuntz, E. (Medizinische Klinik II, Kreis- und Stadtkrankenhaus, Wetzlar, Germany). *Med. Klin. (Mosk)* 70(7):274-278, 1975.

7658 GAMMA-GLUTAMYL TRANSPEPTIDASE, MOST SENSIBLE INDICATOR FOR THE ASSESSMENT OF COMPLETE CURE OF ACUTE VIRUS HEPATITIS? *(Ger.)* Eisenberg, K.; Ortmans, H. (Medizinische Klinik I und Zentrallaboratorium des Stadtkrankenhauses Kassel, Germany). *Med. Klin. (Mosk)* 70(7):270-273, 1975.

7659 SERUM LIPIDES AND SERUM LIPOPROTEINS IN LIVER DISEASES. *(Ger.)* Greiner, S.; Weinbeck, M.; Englhardt, A. (Medizinische Klinik der Universitat, Marburg/Lahn, Germany). *Med. Klin. (Mosk)* 70(6):231-241, 1975.

7660 CONSECUTIVE DISEASES AFTER INFECTIOUS HEPATITIS. *(Ger.)* Morl, M. (Medizinischen Klinik der Universitat Erlangen-Nurnberg, Nurnberg, Germany). *Fortschr. Med.* 93(2):49-51, 1975.

7661 CONDITIONS FOLLOWING VIRUS HEPATITIS. *(Cz.)* Cervenka, J.; Zacharova, M.; Ottis, V. (Odboru epidemiologie Vyskumneho ustavu epidemiologie a mikrobiologie, Palisady 47, 881 27 Bratislava, Czechoslovakia). *Bratisl. Lek. Listy* 63(4):482-488, 1975.

7662 EPIDEMIOLOGICAL COMPARATIVE STUDIES OF AUSTRALIA ANTIGEN AND ENZYME SCREENING TEST RESULTS CARRIED OUT IN FAMILIES. *(Ger.)* Beck, R.; Puschel, J.; Friedemann, H.; Tacke, A.; Geserick, G.; Anton, I.; Neumann, A. (Hygiene-Inspektion, 1058 Berlin, Germany). *Z. Gesamte Hyg.* 20(9):601-605, 1975.

7663 ON THE EFFECTIVENESS OF GAMMA GLOBULIN PROPHYLAXIS IN FAMILIES DURING INFECTIOUS HEPATITIS INCUBATION SUBJECTED TO ENZYME SCREENING TEST CONTROL. *(Ger.)* Beck, R.; Puschel, J.; Friedemann, H.; Neumann, A.; Redlich, V. (Hygiene-Inspektion, 1058 Berlin, Germany). *Z. Gesamte Hyg.* 20(9):605-607, 1974.

7664 INVESTIGATIONS ON THE PRESENCE OF HEPATITIS ANTIGEN AND OF THE HOMOLOGOUS ANTIBODIES IN VETERINARIANS AND WORKERS ATTENDING TO ANIMALS. *(E.)* Surdan, C.; Cruceanu, A.; Babes, V. T.; Milcov, V.; Sorodoc, G.; Cajal, St. ("Stefan S. Nicolau" Inst. Virology, Bucharest, Romania). *Rev. Roum. Virol.* 25(4):343-345, 1974.

7665 THE INCIDENCE OF HEPATITIS WITH HB Ag AMONG THE MEDICO-SANITARY PERSONNEL. *(E.)* Bals, M. G.; Bocarnea, C.; Caruntu, Fl.; Duminica, A.; Angelescu, C.; Hagiescu, L.; Toma, E.; Tudose, M. (Colentina Hosp., Bucharest, Romania). *Rev. Roum. Virol.* 25(4):365, 1974.

7666 TECHNIQUE FOR THE VISUALIZATION OF PRECIPITATION BANDS OBTAINED BY GEL IMMUNODIFFUSION REACTIONS FOR HEPATITIS B ANTIGEN DETECTION. *(E.)* Cruceanu, A.; Babes, V. T. ("Stefan S. Nicolau" Inst. Virology, Bucharest, Romania). *Rev. Roum. Virol.* 25(4):303-308, 1974.

7667 IMMUNOFLUORESCENT DETECTION OF HEPATITIS B ANTIGEN IN PARAFFIN-EMBEDDED LIVER TISSUE. *(E.)* Ray, M. B.; Desmet, V. J. (Dept. Medische Navorsing, B 3000 Leuven, Belgium). *J. Immunol. Methods* 6(3):283-289, 1975.

7668 CLINICAL COURSE OF VIRAL HEPATITIS. *(E.)* Wewalka, F. (no affiliation given). *Clin. Gastroenterol.* 3(2):355-376, 1974.

7669 THE LABORATORY IN THE DIAGNOSIS AND MANAGEMENT OF VIRAL HEPATITIS. *(E.)* McIntyre, N.; Heathcote, J. (no affiliation given). *Clin. Gastroenterol.* 3(2):317-336, 1974.

7670 IMMUNE RESPONSE IN ACUTE VIRAL HEPATITIS. *(E.)* Berg, P. A. (no affiliation given). *Clin. Gastroenterol.* 3(2):255-275, 1974.

7671 PROPHYLAXIS OF VIRAL HEPATITIS. *(E.)* Kaboth, U.; Junge, U. (no affiliation given). *Clin. Gastroenterol.* 3(2):453-470, 1974.

7672 EPIDEMIOLOGY OF SERUM HEPATITIS. *(E.)* Ringertz, O. (no affiliation given). *Clin. Gastroenterol.* 3(2):305-316, 1974.

7673 EPIDEMIOLOGY OF INFECTIOUS HEPATITIS. *(E.)* Krejs, G. J.; Gassner, M.; Blum, A. L. (no affiliation given). *Clin. Gastroenterol.* 3(2):277-03, 1974.

7674 THE VIRUSES OF HEPATITIS. *(E.)* Waterson, A. P. (no affiliation given). *Clin. Gastroenterol.* 3(2):241-254, 1974.

7675 POSTHEPATITIS SYNDROMES. *(E.)* Martini, G. A.; Stronheyer, G. (no affiliation given). *Clin. Gastroenterol.* 3(2):377-390, 1974.

7676 VIRAL HEPATITIS IN INFANCY AND CHILDHOOD. *(E.)* Rotthauwe, H. W. (no affiliation given). *Clin. Gastroenterol.* 3(2):437-452, 1974.

See also, 7596, 7619, 7640, 7697, 7720, 7730, 7895.

LIVER AND BILIARY TRACT

Chronic Hepatitis

7677 ELECTRON MICROSCOPIC OBSERVATIONS ON CHRONIC AGGRESSIVE HEPATITIS: PARTICIPATION OF HEPATOCYTES IN LIVER FIBROSIS. *(E.)* Groniowski, J.; Walski, M. (Inst. Biostructure, Chalubinskiego 5, Warsaw, Poland). *Pathol. Eur.* 10(1):37-50, 1975.

The progressive fibrosis of the liver parenchyma which occurs in chronic aggressive hepatitis was studied in seven cases of clinically diagnosed and histologically proven chronic aggressive hepatitis. Needle biopsy specimens of the liver were examined by light and electron microscopy. Newly formed collagen fibrils were deposited in the Disse spaces and in the widened intercellular spaces. In four cases, collagen fibrils were also observed intracellularly inside single hepatocytes; the fibrils were usually located in the central part of the cell where they formed small bundles with no surrounding membrane. Deep infoldings of the plasma membrane containing some clusters of fibrils were often found, but the possibility of invagination of collagen fibrils from the outside was ruled out. In two other cases, the hyaloplasm of the hepatocytes occasionally contained randomly distributed crystalline structures which were unrelated to the cell organelles. These structures appeared to be made up of aggregates of protein molecules. The coincidence of cystalloids in the mitochondrial matrix and crystalline structures in the hyaloplasm of the hepatocytes was noted in one case. Hepatocytes containing the crystalline and/or filamentous structures were otherwise of normal or nearly normal appearance. The presence of collagen fibrils in the hyaloplasm of the hepatocytes tentatively suggests that these cells may participate in collagen biosynthesis in the course of chronic aggressive hepatitis. The data indicate that in some pathological conditions, the production of fibrous collagen is not the exclusive function of the mesenchymal fibroblastic cells.

7678 CHRONIC PERSISTENT HEPATITIS. A CLINICAL, SEROLOGICAL, AND PROGNOSTIC STUDY. *(E.)* Dietrichson, O. (Kommunehospitalet, DK-1399, Copenhagen K, Denmark). *Scand. J. Gastroenterol.* 10(3): 249-255, 1975.

The incidence and degree of different clinical, biochemical, and immunological variables are described in a consecutive series of 26 patients with chronic persistent hepatitis. These included 16 males and 10 females, aged 10 to more than 50-yr, with most patients falling in the 20 to 29-yr-old range. The onset of disease was acute in 22 cases (84.6%). The average time from admission to diagnosis of chronic persistent hepatitis was 13.2 months. Of three patients with a history of high oxyphenasitin intake, two were challenged with the drug, and the challenge produced a significant increase in liver function parameters in one. Physical examination showed spider naevi in two cases, one of whom also had palmar erythema. Only three patients had elevated serum bilirubin values. Alkaline phosphatases were increased in six cases. Immunoglobulin G was elevated in approximately 50% of patients. Australian antigen was demonstrated in the sera of 12 patients (46%). Follow-up studies included one or more repeat biopsies in 16 patients, and clinical and biochemical follow-ups in all 26 patients. In three cases, the last repeat biopsy showed progression to cirrhosis, severe portal fibrosis, and chronic aggressive hepatitis. Of 26 patients, 17 were completely well without evidence of liver disease. It is recommended that the course of disease be followed in patients with chronic persistent hepatitis to reveal the few cases which progress to active liver disease.

7679 DIAGNOSIS, THERAPY AND CLINICAL COURSE IN CHRONIC ACTIVE HEPATITIS IN CHILDHOOD WITH SPECIAL REFERENCE TO IMMUNOLOGICAL FINDINGS. *(Ger.)* Baumann, W. (Univ. Clin. Pediatr., Mainz, Germany). *Monatsschr. Kinderheilkd.* 122(12):904-913, 1974.

The cases of nine patients with chronic active hepatitis (aged 1.3-16.9 yr) are evaluated and pathogenetic implications of humoral and cellular autoimmune phenomena and of the Australia antigen (HB$_s$Ag) are discussed. Follow-up examinations covered between 11 months and 6.10 yr. The diagnosis was based on chronicity of the hepatopathy at least over several months and a tendency to exacerbation, hepatosplenomegaly, persistently increased transaminase activity, hypergammaglobulinemia, pathological humoral and cellular immune response, and morphological signs of chronic aggressive hepatitis. In contrast to published data concerning adult patients, children with HB$_s$Ag-positive tests showed humoral and cellular immune disturbances, as did a considerable percentage of the HB$_s$Ag-negative children. A nonparenteral route of infection was postulated for one of the HB$_s$Ag-positive cases since HB$_s$Ag could be detected in three related persons. Simultaneous manifestation of chronic active hepatitis and persistence of HB$_s$Ag in a certain family may indicate a hereditary genetic aberration or immune defect. Furthermore, based on an observation reported here, attention is drawn to the possibility of drug-induced chronic active hepatitis: three children were treated with azathioprine in combination with small doses of glucocorticosteroids, and four received glucocorticosteroids only. It is concluded that in selected cases, an immunosuppressive regimen is preferred with regard to frequency of relapses, cirrhotic transformation and side effects. Analysis of transaminases, γ-globulins, humoral and cellular immune response, and morphological examination of liver tissue are adequate tools for follow-up.

7680 IMMUNOLOGICAL STUDIES IN PATIENTS WITH CHRONIC ACTIVE HEPATITIS: CYTOTOXIC ACTIVITY OF LYMPHOCYTES TO AUTOCHTHONOUS LIVER CELLS GROWN IN TISSUE CULTURE.

(E.) Paronetto, F.; Vernace, S. (Veterans Admin. Hosp., 130 W. Kingsbridge Road, Bronx, N.Y. 10468). *Clin. Exp. Immunol.* 19(1):99-104, 1975.

The cytotoxic activity of lymphocytes against autochthonous liver cells grown in tissue culture was studied, to determine whether a cell-mediated immune process plays a role in the pathogenesis of some liver diseases. Cells were taken from 26 patients with chronic active and chronic persistent hepatitis, acute viral hepatitis, miscellaneous liver diseases, and patients without histological evidence of liver disease. Cytotoxic activity of lymphocytes against autochthonous liver cells was displayed in one patient with primary biliary cirrhosis, eight of 10 cases of chronic active hepatitis, and two patients with chronic persistent hepatitis. Of 12 patients with chronic persistent or chronic active hepatitis, six had hepatitis B antigen (HBAg) detected in serum by double antibody radioimmunoassay. Lymphocytotoxicity was seen with equal incidence (five of six patients) in both HBAg-positive and HBAg-negative cases. Lack of cytotoxicity was associated with steroids or azathioprine treatment. Lymphocytotoxicity was also seen in three of five patients with HBAg-positive acute viral hepatitis. In the group with miscellaneous liver diseases, only one patient (with alcoholic hepatitis and pancreatic carcinoma) exhibited reactivity of lymphocytes against autochthonous liver cells. Phytohemagglutinin-induced lymphocytotoxicity was studied in all patients. Smooth muscle antibodies were detected in two cases with chronic active hepatitis. Nuclear antibodies were seen in one case of acute viral hepatitis, and mitochondrial antibodies were seen in the patient with primary biliary cirrhosis. These results indicate *in vitro* reactivity of patient lymphocytes with some liver diseases, and support the suggestion that an *in vivo* aggressive activity of lymphocytes against liver cells plays a role in the pathogenesis of some liver diseases.

7681 ANTIBODIES TO DOUBLE-STRANDED (NATIVE) DNA IN ACTIVE CHRONIC HEPATITIS.

(E.) Davis, P.; Read, A. E. (Dept. Medicine, Univ. Bristol, England). *Gut* 16(6):413-415, 1975.

The presence of double-stranded DNA antibodies was investigated in systemic lupus erythematosus and chronic active hepatitis. Sera from 36 patients with chronic active hepatitis were compared with sera from patients with systemic lupus erythematosus. Sera were also tested from patients with other liver diseases, including primary biliary cirrhosis, alcoholic cirrhosis, and acute viral hepatitis. A modification of the Farr test was used for the detection of antibody to DNA antigens. The normal range for DNA binding was 0-30% (mean 11%) calculated from sera of 200 normal controls. Of 36 hepatitis patients, 17 (47%) had levels of DNA binding in the range (0-50%, mean 26%) previously reported only in active cases of systemic lupus erythematosus. None of the patients with other liver diseases had DNA antibody levels outside the normal range (mean 12%). All chronic active hepatitis patients with significantly elevated DNA antibodies had positive antinuclear antibody, and in all five in whom it was measured, smooth muscle antibody was found. DNA binding ranged from 0-93% (mean 40%) in patients with active and inactive systemic lupus erythematosus. These preliminary studies suggest that detection of antibodies to double-stranded DNA may be of future value in the study of chronic active hepatitis.

7682 LYMPHOCYTE CYTOTOXICITY TO AUTOLOGOUS LIVER CELLS IN CHRONIC ACTIVE HEPATITIS.

(E.) Wands, J. R.; Isselbacher, K. J. (Harvard Medical Sch., Boston, Mass. 02114). *Proc. Natl. Acad. Sci. USA* 72(4):1301-1303, 1975.

The effect of prednisone therapy *in vivo* on lymphocyte cytotoxicity toward Chang liver cells and *in vitro* toward autologous liver cells was investigated. Cells were obtained at biopsy from nine patients with chronic active hepatitis and three patients with chronic persistent hepatitis. Peripheral lymphocytes from patients with chronic active hepatitis were spontaneously cytotoxic to human Chang liver cells when tested at a lymphocyte:target cell ratio of 200:1. The mean spontaneous lymphocytotoxicity in patients with chronic active hepatitis was 9.6% compared with 3.6% in normal controls. There was no difference in concanavalin A (10 μg/ml) maximally stimulated cytotoxicity between patient and control lymphocytes. Patient lymphocytes were markedly cytotoxic to autologous liver cells (26.1%) compared with controls (2.7%). Patient lymphocytes were more cytotoxic toward autologous liver cells than to the Chang liver cell line. Chronic prednisone administration (30-60 mg/day for a mean of 2.5 months) in five patients with chronic active hepatitis in clinical remission markedly inhibited both spontaneous and concanavalin A-stimulated lymphocytotoxicity to Chang liver cells. Spontaneous lymphocytotoxicity decreased from 9.6% to 2.8%, and concanavalin A-stimulated cytotoxicity from 36.0% to 7.4% with prednisone therapy ($P < 0.005$). Prednisone therapy *in vivo* diminished lymphocytotoxicity *in vitro* toward autologous liver cells. These results show that prednisone treatment of patients with chronic active hepatitis results in a marked inhibition of the effector cytolytic phase of cell-mediated immunity.

7683 DEMONSTRATION OF SMOOTH MUSCLE CONTRACTILE PROTEIN ANTIGENS IN LIVER AND EPITHELIAL CELLS.

(E.) Holborow, E. J.; Trenchev, P. S.; Dorling, J.; Webb, J. (Canadian Red Cross Memorial Hosp., Taplow, Maidenhead, Berkshire, England). *Ann. N.Y. Acad. Sci.* 254:489-504, 1975.

Immunofluorescence and immunoperoxidase labeling were used to study the distribution of the different contractile smooth muscle-type proteins in tissues other than smooth muscle with antisera raised against the different proteins. Myosin, actin, tropomyosin, and heavy meromyosin were purified from uterus specimens, and antisera to these proteins raised in rabbits. Rat and guinea pig liver sections and rat stomach, duodenal, and kidney sections were stained and examined under the light and immunoelectron microscopes. By light microscopy, the antisera against all four proteins displayed polygonal staining patterns similar to those revealed by immunofluorescence with the same sera. Serum from a patient with neuroblastoma showed a similar but more marked staining, which appeared to delineate the biliary canaliculi. Immunoelectron microscope results with the peroxidase reagent showed that antiactin was reacting with a submembranous region of the guinea pig liver cell. In addition, staining was especially localized around the tight junctions of biliary canaliculi. Filaments were seen in some areas, although the morphologic characteristics of the staining were not well defined. Submembranous and tight junction regions of liver cells and biliary canaliculi were similarly stained with neuroblastoma serum. Apical staining by both the immunofluorescence and immunoperoxidase methods was seen in cells of the gastric and duodenal mucosa and the renal tubular epithelium. Antiheavy meromyosin serum produced a bile duct staining pattern. The electron microscope showed apical staining of duodenal epithelial cells with antiheavy meromyosin and antiactin, involving a band of filaments just below the villi of each cell. Neuroblastoma serum stained gastric, duodenal, and renal tubular cells similarly to the staining in liver. These results provide immunologic evidence of the presence of actin and heavy meromyosin in submembranous liver cells and in gastrointestinal and kidney epithelium, all of which are important sites of endocytosis and the release of secretions based on cell membrane movement. These two smooth muscle proteins also appear to be involved in the cell-to-cell adhesion mechanisms operating at tight junctions.

7684 GLUCOCORTICOIDS IN CHRONIC LIVER DISEASE.

(Ger.) Maier, K. P.; Talke, H.; Gerok, W. (Med. Clin., Univ. Freiburg/Breisgau, Germany). *Dtsch. Med. Wochenschr.* 100(11):560-563, 1975.

Since there is no proof that glucocorticoids shorten the course of acute hepatitis or prevent it from becoming chronic, their use cannot be justified except for patients in hepatic coma. Some investigators report that glucocorticoids increase survival in patients with chronic aggressive hepatitis, but conflicting results have been obtained about whether they induce clinical, biochemical, and histological remissions. Discontinuation of therapy often results in recurrences. Glucocorticoids are not indicated for treatment of chronic persistent hepatitis because of its benign course and the serious side-effects these drugs can produce. In a small controlled study, glucocorticoids increased survival from 15% to 62% in cirrhosis, but a larger study found no significant difference between the survival of treated patients and untreated controls. In the latter study, the only group of patients benefiting from therapy was nonalcoholic women with no ascites; males with ascites had significantly shorter survival times than untreated controls. There is no evidence that glucocorticoids lengthen survival in patients with alcoholic steatosis or alcoholic hepatitis.

7685 TESTS RELATED TO COPPER METABOLISM: ABNORMALITIES IN CHRONIC ACTIVE LIVER DISEASE (CALD).

(E.) LaRusso, N. F.; Summerskill, W. H. J.; McCall, J. T. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 68(4):993, 1975.

7686 FURTHER STUDIES ON THE CYTOTOXIC ACTIVITY OF LYMPHOCYTES AGAINST LIVER CELLS IN PATIENTS WITH CHRONIC HEPATITIS (CH).

(E.) Paronetto, F.; Vernace, S. J.; Colombo, M. (VA Hosp., Bronx, N.Y.). *Gastroenterology* 68(4):965, 1975.

7687 ANTIGLOMERULAR ANTIBODY (AGA) AS A DIAGNOSTIC TOOL FOR THE CIRRHOTIC STAGE OF CHRONIC ACTIVE HEPATITIS (CAH).

(E.) Lopes, J. D.; Camargo, M. E.; Pontes, J. F.; Raia, S.; Da Silva, L. C. (Inst. Med. Trop. Ibepege, Sao Paulo, Brazil). *Gastroenterology* 68(4):938, 1975.

7688 DISTURBANCES OF ALBUMIN METABOLISM IN CHRONIC CHOLESTATIC HEPATITIS.

(Rus.) Vinogradov, V. F.; Podymova, S. D. (I. M. Sechenov 1st Moscow Medical Inst., USSR). *Sov. Med.* (2):21-26, 1975.

7689 STRUCTURAL AND FUNCTIONAL INVESTIGATIONS OF THE LIVER AND VALUE OF THE ELECTRON MICROSCOPIC METHOD IN CHRONIC HEPATITIS IN CHILDREN.

(Rus.) Ebels, I. G.; Sinelnikova, M. P. (Riga Medical Inst., USSR). *Pediatriia* (3):45-51, 1975.

7690 CYCLIC FLUCTUATIONS OF ENZYMATIC STATUS OF THE BLOOD LYMPHOCYTES DURING PREDNISOLONE TREATMENT IN CHILDREN WITH CHRONIC LIVER DISEASE. *(Rus.)* Chistova, L. V.; Shischenko, V. M.; Suslova, G. F.; Nartsissov, R. P. (Inst. Pediatrics, Moscow, USSR). *Pediatriia* (3):62-67, 1975.

7691 SURGICAL TREATMENT OF CHRONIC HEPATITIS. *(Fr.)* Milonov, O. B. (Inst. Clinical Experimental Surgery, Moscow, USSR). *Lyon Chir.* 71(2):85-88, 1975.

7692 RELATIONSHIPS BETWEEN BIOLOGICAL PROTIDOPOYESIS AND TRANSMETHYLATION: ACTIVITY OF S-ADENOSYLMETHIONINE ON PROTEIC CRASIS IN CHRONIC HEPATOPATHIES. *(It.)* Cantoni, L.; Maggi, G.; Mononi, G.; Preti, G. (Greater Hosp., Milan, Italy). *Minerva Med.* 66(33): 1581-1589, 1975.

7693 CHRONIC HEPATITIS: DIAGNOSTIC AND THERAPEUTIC PROBLEMS. *(It.)* Verme, G.; Rizzetto, M.; Bonino, F. (Ospedale Mauriziano, 46 Torino, Italy). *Minerva Med.* 66(31):1439-1452, 1975.

7694 INTRADERMIC REACTIVITY EVALUATION TO PPD-TEST IN CHRONIC LIVER DISEASES AND CIRRHOSIS. *(It.)* Sciaccaluga, M. (Clinica Medica Generale e Terapie Medica, Univ. delgi Studi, Modena, Italy). *Minerva Med.* 66(27):1295-1299, 1975.

7695 IMMUNOGLOBULINS, AUTOANTIBODIES, AND AUSTRALIA ANTIGEN IN CHRONIC HEPATITIS. *(Sp.)* Torruella, M.; Guardia, J.; Martinez-Vazquez, J. M.; Bacardi, R.; Tornos, J.; Mari, L.; Gallart, M. T.; Martin, M. D. C. (Departmento de Medicina Interna de la Seguridad Social, Universidad Autonoma, Barcelona, Spain). *Rev. Clin. Esp.* 134(6):553-558, 1974.

7696 THIAZOLIDIN-CARBOXYLIC ACID IN THE AMBULATORY TREATMENT OF CHRONIC HEPATOPATHIES. *(Fr.)* Russu, G.; Lungu, I.; Boingeanu, A. (Inst. de Medecine, Pharmacie de Iasi, Iasi, Rumania). *Rev. Med. Chir.* 78(3):585-590, 1974.

7697 PATHOGENETIC ASPECTS OF IMMUNOGLOBULINS OF HAA POSITIVE AND HAA NEGATIVE LIVER DISEASES. *(Ger.)* Reis, H. E.; Bertrams, J.; Kuwert, E.; Selmair, H.; Wiese, W. (Medizinische Klinik I des Stadtkrankenhauses Kassel, Germany). *Med. Klin.* 69(39):1579-1586, 1974.

7698 THE EFFECT OF LOADING OF LYSOSOMES OF THE LIVER WITH TRITON WR 1339 ON THE DEVELOPMENT OF CHRONIC TOXIC HEPATITIS. *(Rus.)* Korolenko, T. A.; Titova, V. G.; Dobrovolskaya, S. G.; Yakobson, G. S. (Novosibirsk Medical Inst., Novosibirsk, USSR). *Biull. Eksp. Biol. Med.* 79(1):21-23, 1975.

7699 CHRONIC VIRAL HEPATITIS. *(E.)* Hadziyannis, S. J. (no affiliation given). *Clin. Gastroenterol.* 3(2):391-408, 1974.

See also, 6892, 7621, 7650, 7656, 7659, 7739, 7740, 7743, 7744.

LIVER AND BILIARY TRACT

Alcoholic Liver Disease

7700 ACUTE ALCOHOLIC HEPATITIS. PROGNOSTIC AND THERAPEUTIC PROBLEMS. *(Fr.)* Hecht, Y.; Benisty, H.; Caroli, J. (Service du Pr Caroli-Hopital St. Antoine 184, rue du Faubourg St. Antoine, 75012 Paris). *Med. Chir. Dig.* 3(6):383-388, 1974.

A retrospective study of 41 cases of acute alcoholic hepatitis (AAH) was directed toward the treatment of this affliction and the use of corticosteroid therapy. Two subgroups were designated: 21 uncomplicated cases and 20 severe forms. Severity was defined in terms of jaundice (bilirubin, 50 mg/l), major hemostasis changes (Quick < 40%, and/or accelerine < 50%), clinical encephalopathy with minimum liver flap and severe hypofixation of colloidal gold. The efficacy of the treatment was judged both on a short term (ST) basis (remission of the hepatocellular insufficiency) and a long term (LT) basis (length of survival and biological outcome) for the ordinary hepatitis and the surviving severe cases. In ST evolution, 12 patients were treated with corticosteroids; seven survived. Of the other eight who did not receive corticosteroids only two lived. On a LT basis in five patients (having undergone iterative laparoscopy) and in two verifications by autopsy, the development of an enlarged smooth liver towards a cirrhotic, nodular liver was observed. Despite the lack of randomization and the statistically nonsignificant difference in favor of corticosteroids, the authors conclude that corticosteroids may be used effectively in severe forms of AAH.

7701 SERUM FREE PROLINE AND FREE HYDROXYPROLINE IN PATIENTS WITH CHRONIC LIVER DISEASE. *(E.)* Mata, J. M.; Kershenobich, D.; Villareal, E.; Rojkind, M. (Instituto Nacional Nutrician, Mexico City, Mexico). *Gastroenterology* 68(5):1265-1269, 1975.

Levels of free proline and hydroxyproline were studied in patients with various diseases to determine whether these levels reflect the metabolic state of fibrous tissue in the liver of patients with alcoholic cirrhosis. The 133 subjects studied included 24 healthy controls, 45 alcoholics with cirrhosis, 15 nonalcoholics with cirrhosis, 11 patients with chronic active liver disease, nine patients with alcoholic hepatitis, 19 severely ill patients without liver disease and 19 malnourished patients. The amount of proline in normal sera was 0.158 μM/ml, and of hydroxyproline, 0.0067 μM/ml. Similar values were obtained in nonalcoholic patients with cirrhosis and patients with chronic active hepatitis. Both values were below normal in malnourished patients, although the difference was not statistically significant. Significantly lower serum proline values were seen in severely ill patients without liver disease (0.104 μM/ml). Serum proline and hydroxyproline were significantly increased in patients with alcoholic cirrhosis (0.232 and 0.0107 μM/ml, resp.). The highest values were found in the nine patients with alcoholic hepatitis, at 0.363 μM/ml for proline and 0.0112 μM/ml for hydroxyproline. These results show a significant increase in free proline and hydroxyproline in patients with alcoholic liver disease. It is suggested that the changes in free amino acids reflect an increase in collagen catabolism secondary to an increase in the rate of synthesis.

7702 PORTACAVAL SHUNT AS EMERGENCY PROCEDURE IN UNSELECTED PATIENTS WITH ALCOHOLIC CIRRHOSIS. *(E.)* Orloff, M. J.; Charters, III, A. C.; Chandler, J. G.; Condon, J. K.; Grambort, D. E.; Modafferi, T. R.; Levin, S. E.; Brown, N. B.; Sviokla, S. C.; Knox, D. G. (Sch. Medicine, Univ. California, San Diego). *Surg. Gynecol. Obstet.* 141(1):59-68, 1975.

A 12-yr evaluation is presented of emergency portacaval shunt in 138 consecutive patients with alcoholic cirrhosis and bleeding esophageal varices. In all patients, diagnostic examinations were completed within seven hr, and patients were operated on within 8.5 hr. Lifelong follow-up studies were made, and the factors influencing the patient survival were determined. Of patient characteristics (age, sex, history of alcohol intake, associated diseases, and the number of bleeding episodes) studied, only abstinence from alcohol for more than one month prior to bleeding (15% of patients; 71% survival) was associated with increased survival after surgery ($P < 0.05$). Clinical and laboratory findings of ascites on admission were associated with a 36% survival ($P < 0.001$). Systemic administration of posterior pituitary extract (20 U, i.v.) temporarily controlled varix bleeding in 94% of patients. All patients had portal hypertension, with a corrected average free portal pressure of 267 mm of saline. In 32% free portal pressure was not higher than hepatic occluded portal pressure prior to shunt, suggesting spontaneous reversal of portal blood flow. The early survival rate for this group of patients (38%) was significantly lower ($P < 0.05$) than that for the other patients (61%). There was no difference between the survival rate of 51% in patients receiving side-to-side portacaval shunt (106 patients) and the 59% survival rate for those undergoing end-to-side portacaval shunt (29). The statistically significant factors influencing survival were: abstinence from alcohol longer than one month preoperatively, absence of ascites, only mild to moderate muscle wasting, enlarged liver, no spontaneous reversal of portal flow, and complete postoperative abstinence from alcohol. The predicted age-adjusted seven-yr survival rate for these patients was 37%. The actual seven-yr survival rate of 40 patients operated on seven or more yr ago was 42.5%. It is concluded that emergency portacaval shunt is superior to nonoperative treatment and produces a significant increase in long-term survival. These data further suggest that a return to alcoholism is the most important factor influencing long-term survival, and its prevention lies in persistent and frequent observation.

7703 CHRONIC ETHANOL INTAKE BLOCKS THE INTESTINAL TRANSPORT OF SODIUM IN MAN. *(E.)* Mekhjian, H. S.; Sury, T.; Baba, N. (Ohio St. Univ., Columbus, Ohio). *Gastroenterology* 68(4):953, 1975.

7704 ALCOHOLIC HYPERTRIGLYCERIDEMIA: PREVALENCE AND CLINICAL CORRELATIONS. *(E.)* Lifton, L.; Scheig, R. (Dep. Gastroenterol., Univ. Connecticut, Hartford, Conn.). *Gastroenterology* 68(4):936, 1975.

7705 SYMPTOMATIC INTESTINAL DISACCHARIDASE DEFICIENCY IN ALCOHOLICS. *(E.)* Perlow, W.; Baraona, E.; Lieber, C. S. (Bronx VA Hosp., New York, N.Y.). *Gastroenterology* 68(4):935, 1975.

7706 PLASMA ESTRONE AND PROLACTIN CONCENTRATIONS ARE ELEVATED IN MEN WITH GYNECOMASTIC AND SPIDER ANGIOMATA. *(E.)* Van Thiel, D. H.; Gavaler, J. S.; Lester, R. (Dep. Med., Univ. Pittsburgh, Pittsburgh, Pa.). *Gastroenterology* 68(4):934, 1975.

7707 ETHYL ALCOHOL AND LIVER TRYPTOPHAN OXYGENASE. *(E.)* Kumar, G. K.; Hossain, Z.; Sardesai, V. M. (Wayne St. Univ. Sch. Med., Detroit, Mich.). *Gastroenterology* 68(4):931, 1975.

7708 CIRRHOSIS WITH SEVERE HYPOXIA AND ARTERIOVENOUS SHUNTS IN THE LUNGS: ONE CASE. *(Fr.)* Levy, V. G.; Beaugrand, M.; Vincent, J.; Zaoui, D. (Hopital St. Antoine, 75012 Paris, France). *Med. Chir. Dig.* 3(6):377-381, 1974.

7709 ALCOHOLIC HEPATITIS. *(Dut.)* Dees, J.; Gratama, S.; DeJong, M. (St. Franciscus Gasthuis, Rotterdam, Netherlands). *Ned. Tijdschr. Geneeskd.* 119(5):184-191, 1975.

7710 ALCOHOLIC HEPATITIS. STUDY OF 19 CASES. *(Por.)* Goncalves, C. S.; Boni, E. S.; Buaiz, V.; Zanotti, W. M.; Zanzandrea, B.; Pereira, F. E. L. (Centro Bio-Medico da UFES, 29000 Vitoria, ES, Brazil). *Arq. Gastroenterol.* 12(1):27-36, 1975.

7711 THE DIAGNOSIS OF CHRONIC ALCOHOLIC LIVER DAMAGE. *(Ger.)* Stotzner, H. (Medizinische Akademie "Carl Gustav Carus", Dresden, Germany). *Dtsch. Gesundheitsew.* 29(45):2143-2147, 1974.

7712 CLINICAL SYMPTOMS AND PROGNOSIS IN ACUTE ALCOHOLIC HEPATITIS. *(Ger.)* Kommerell, B. (Medical Clinic, Univ. Heidelberg, Heidelberg, Germany). *Therapiewoche* 24(51):6032-6033, 1974.

7713 ZIEVE'S SYNDROME. *(Ger.)* Uhl, N. (Medical Polyclinic, Univ. Heidelberg, Heidelberg, Germany). *Therapiewoche* 24(51):6033-6039, 1974.

7714 CLINICAL AND LABORATORY DIFFERENTIATION OF ALCOHOLIC HEPATITIS, FATTY LIVER, AND CIRRHOSIS. *(E.)* Cline, W.; Reinold, J.; Dernbach, W.; Heubner, T.; Fardal, P.; Olsen, W. A. (VA Hosp., 2500 Overlook Terrace, Madison, Wisc. 53705). *Wis. Med. J.* 74(7):78-80, 1975.

7715 RED CELL VOLUME IN ALCOHOLIC CIRRHOSIS. *(Fr.)* Jaulin, P.; Senecal, P.; Debray, C. (Hosp. Bichat, Paris, France). *Arch. Fr. Mal. App. Dig.* 63(8):631-637, 1974.

7716 ALCOHOLIC LESIONS OF THE LIVER (MORPHOLOGY AND SOME PROBLEMS OF PATHOGENESIS). *(Rus.)* Lebedev, S. P.; Potekaeva, M. A.; Mukhin, A. S. (Moscow, Med. Inst., USSR). *Arkh. Patol.* 37(32):54-62, 1975.

7717 THE LIVER FUNCTION IN PATIENTS WITH CHRONIC ALCOHOLIC DISEASE. *(Rus.)* Kosilova, L. M. (Kharkov Med. Inst., USSR). *Vrach. Delo* (4):32-34, 1975.

7718 STUDIES OF THE LIVER FUNCTION IN PATIENTS WITH CHRONIC ALCOHOLIC DISEASE BY LABELLED ISOTOPE HEPATOGRAPHY. *(Rus.)* Shmakov, Iu. G.; Tarasov, B. M.; Vetlugin, A. A. (Chernigov Reg. Hosp., USSR). *Vrach. Delo* (4):30-32, 1975.

7719 CLINICAL PROBLEMS OF ALCOHOLIC CIRRHOSIS. I. BIOLOGICAL AND CLINICAL CHARACTERISTICS OF THE ALCOHOLIC CIRRHOSIS OF THE LIVER. *(Ser.)* Knezevic, S.; Falisevac, V.; Kallai, L.; Hadzic, N.; Pichler, E.; Spicer, F. (Dept. Med., Univ. Hosp. Zagreb, Yugoslavia). *Acta Med. Iugosl.* 28(4):399-353, 1974.

See also, 7183, 7212, 7612, 7854.

LIVER AND BILIARY TRACT

Cirrhosis

7720 SERUM HAPTOGLOBIN TYPE AND LIVER CIRRHOSIS. *(E.)* Hirayama, C.; Nakamura, M.; Koga, S. (Faculty Medicine, Kyushu Univ., Fukuoka, Japan). *Humangenetik* 28(2):139-146, 1975.

The distribution of haptoglobin phenotypes was studied in 105 patients (81 males and 24 females, age range 15-74 yrs) with liver cirrhosis of different etiology, and in 200 blood donors with positive and negative hepatitis B antigen (HBAg). Seventy-nine percent of the cirrhotic patients had a non-alcoholic etiology. HBAg and hepatitis B antibody (HBAb) were determined by immunoelectroosmophoresis and haptoglobins were phenotyped by vertical acrylamide gel electrophoresis. No significant differences in the haptoglobin gene (Hp^1) concentration were observed among the HBAg positive and negative donors; cirrhotic patients showed increased Hp^1 frequency, which was associated with non-alcoholic patients. Severe liver dysfunction was also associated with the presence of Hp^1. Since the family pedigrees of the patients with type 1-1, a haptoglobin phenotype, excluded individuals with type 2-2, the haptoglobin phenotype was stable in the cirrhotic process. Hp^1 was associated with severe liver dysfunction and Hp^2 was not. Therefore, Hp^2 may offer resistance to liver dysfunction.

7721 CONVERSION OF ANDROGENS TO ESTROGENS IN CIRRHOSIS OF THE LIVER. *(E.)* Gordon, G. G.; Olivo, J.; Rafii, F.; Southren, A. L. (New York Medical Coll., N.Y. 10229). *J. Clin. Endocrinol. Metab.* 40(6):1018-1026, 1975.

Androstenedione metabolism in cirrhosis of the liver and the role of this steroid and of testosterone as possible precursors for the estrogen excess in this disease were studied. The metabolic clearance rate of $7\text{-}\alpha\text{-}^3H$-testosterone and $7\text{-}\alpha\text{-}^3H$-androstenedione, their interconversions and conversions to estrone and 17β-estradiol were measured in 13 male patients with hepatic cirrhosis, and compared with results from 16 normal controls (eight men and eight women). The conversion ratio of androstenedione to estrone was significantly higher in patients than in normal women. The conversion ratio of androstenedione to estradiol was significantly increased in patients over that in normal men and women. The conversion ratio of androstenedione to testosterone was also significantly higher in cirrhotics than in normal men and women. The conversion ratio of testosterone to estrone and to androstenedione was higher in cirrhotics compared with controls. The plasma concentration, the metabolic clearance rate, and the production rate of testosterone were significantly decreased in cirrhotics compared with normal men. Both the plasma concentration and the production rates of androstenedione were higher in cirrhotics than in normal men. There was greater instantaneous contribution of plasma androstenedione to estrone and estradiol in cirrhotics than in normal men. The instantaneous contribution of testosterone to estrone was increased about threefold in cirrhosis. These data indicate a significant alteration in androstenedione metabolism in men with hepatic cirrhosis.

7722 "HEPATIC" AND "EXTRAHEPATIC" TRIGLYCERIDE LIPASE ACTIVITY IN POST-HEPARIN PLASMA OF NORMALS AND PATIENTS WITH CIRRHOSIS OF THE LIVER. *(E.)* Bolzano, K.; Krempler, F.; Sandhofer, F. (First Dept. Medicine, Landeskrankenanstalten, A-5020 Salzburg, Austria). *Horm. Metab. Res.* 7(3): 238-241, 1975.

Liver triglyceride lipase (TGL) activity of postheparin plasma was measured in five male patients (aged 33-70 yr) with cirrhosis of the liver and in 12 healthy male subjects (aged 19-69 yr). The TGL activity was measured both with and without preincubation of postheparin plasma in protamine sulfate. Before and after incubation, the concentration of free fatty acids (FFA) was estimated. At 0.013 µM of FFA/ml/min, the protamine-resistant TGL activity was greatly reduced in patients with cirrhosis when compared with the control level of 0.266 µM of FFA/ml/min. The protamine inactivated TGL activity was normal. Analysis of serum of the cirrhosis patients revealed no inhibitor of the postheparin TGL. The activity of the protamine-resistant TGL of postheparin plasma was reduced to nearly zero in some patients with markedly impaired liver function. These findings, in agreement with animal experiments conducted earlier, indicate that the protamine-resistant TGL of postheparin plasma is of hepatic origin, while the protamine-inactivated TGL is released from extrahepatic tissues. "Hepatic" TGL activity was about twice as high as the "extrahepatic" TGL activity when measured with an artificial substrate in the postheparin plasma of normal individuals. Based on the results of this study, preincubation with protamine sulfate in a final concentration of 12 mg/ml for 10 min at 27 C is an appropriate method for the selective measurement of hepatic and extrahepatic TGL in human postheparin plasma.

7723 ARTICULAR MANIFESTATIONS OF PRIMARY BILIARY CIRRHOSIS. *(Fr.)* Majer, L.; Dorfmann, H.; Vitale, C.; Kahn, M. F.; de Seze, S. (Lariboisiere Hosp., Paris, France). *Ann. Med. Interne (Paris)* 125(12):933-938, 1974.

Articular manifestations of primary biliary cirrhosis in four patients are reported. Demineralizing osteopathy, followed by xanthomatosis and hyperglobulinemic and cryoglobulinemic purpura were found in one 29-yr-old female patient in whom primary biliary cirrhosis was preceded by acute articular manifestations for 2 yr. Portal hypertension, chronic polyarthropathy, Raynaud's syndrome, Sjogren's syndrome, sclerodactylia, mixed cryoglobulinemia, and diffuse sarcoidosis were established in another 48-yr-old female. Neural dystrophy, scleroderma, cryoglobulinemia, and latent hepatopathy (clinically compatible with chronic biliary cirrhosis) were found in a 63-yr-old male patient. The typical case of a 57 yr-old male patient showed persistent Raynaud's syndrome, telangiectasia of the face, bilateral tibiotarsal arthritis, increased sedimentation reaction, increased IgM level, the presence of mitochondrial antibodies, and slightly increased transaminase level. Australia antigen was not found. Liver biopsy resulted in the diagnosis of chronic biliary cirrhosis.

7724 PRIMARY BILIARY CIRRHOSIS AND MEDICAL TREATMENT OF CHOLESTASIS. *(Nor.)* Stave, R. (Rikshospitalet, Medisinsk audeling A, Norway). *Tiksskr. Nor. Laegeforen* 95(5):296-298, 1975.

Studies on the etiology, pathogenesis, clinical aspects, and prognosis of primary biliary cirrhosis are reviewed, and the medical treatment of the resulting cholestasis is described. Laboratory tests in primary biliary cirrhosis usually reveal increased plasma IgM level, increased alkaline phosphatase level, and positive lipoprotein-X test. Primary biliary cirrhosis can be distinguished from primary and secondary sclerosing cholangitis, and chronic drug-induced cholangitis. While there is no specific therapy for primary biliary cirrhosis available, early diagnosis is essential in view of the treatment of cholestasis, which consists of low-fat diet, diet with medium chain triglycerides, and the administration of liposoluble vitamins such as vitamin A, K and D, as well as calcium. Itching, assumed to be a result of the accumulation of bile salts in the serum, can be controlled by cholestyramine and orally administered anion exchangers.

7725 FIBRINOGEN SURVIVAL IN CIRRHOSIS: IMPROVEMENT BY 'LOW DOSE' HEPARIN. *(E.)* Coleman, M.; Finlayson, N.; Bettigole, R. E.; Sadula, D.; Cohn, M.; Pasmantier, M. (Cornell Univ. Medical Center, 525 E. 68th St., New York, N.Y. 10021). *Ann. Intern. Med.* 83(1):79-81, 1975.

The survival of radiolabeled $[^{125}I]$ fibrinogen was studied in six cirrhotic patients. All patients were in end-stage cirrhosis, and received low-dose heparin therapy (3000 U sodium heparin in 5% glucose every 6 hr in a constant i.v. infusion). $[^{125}I]$ Fibrinogen (autologous in three patients and homologous in three; 20 µCi) was injected i.v., and plasma samples were obtained at 30 min, one, three, and six hr, and then every 12 hr following injection. The mean fibrogen survival before heparin therapy was 52 hr and during therapy, 101.8 hr. The median survival was 56 hr before therapy, and 91 hr during therapy. Evidence of defibrination in these patients included low levels of fibrinogen, platelets, plasminogen, and blood factors II, V, and VII were found. Further evidence for defibrination was the shortened survival of labeled fibrinogen. These data suggest that the defibrination process is a result of disseminated intravascular coagulation. The improvement of fibrinogen survival on low-dose heparin suggests that such doses, although not significantly altering the whole blood clotting time, probably play an active role in the coagulation process.

7726 USE OF BLOOD COMPONENT THERAPY FOR GASTROINTESTINAL BLEEDING IN PATIENTS WITH CIRRHOSIS OF THE LIVER. *(E.)* Sampliner, R. E.; Mobarhan, S.; King, D. M.; Greenberg, M. S.; Iber, F. L.; Grace, N. D. (Lemuel Shattuck Hosp., 170 Morton St., Boston, Mass. 02130). *Johns Hopkins Med. J.* 136(4): 163-167, 1975.

Replacement schedules with different proportions of fresh blood and component therapy consisting of fresh-frozen plasma, platelet concentrate, and packed RBC were compared in bleeding cirrhotic patients. The diagnosis of Laennec's cirrhosis was histologically confirmed in 40 of 50 hospitalized patients, all with gastrointestinal bleeding requiring blood transfusion. The blood replacement schedules included: 1) all fresh blood; 2) 1 U fresh blood following 2 U bank blood; and 3) 1 U packed cells, 1 U fresh-frozen plasma, and 2 U platelet concentrate (component therapy) following each 2 U of bank blood. Each patient had serial determinations of hematocrit, prothrombin time, fibrinogen, platelet count and liver function tests. Esophageal varices were the only source of bleeding in 50% of patients, and hemorrhagic gastritis was the only source in 20%. There were no significant differences in age, sex, liver function tests, hematocrit, fibrinogen level, platelet count, and prothrombin time at the time of assignment into the treatment groups. The blood replacement groups did not differ in mortality: five of 17 in group 1 died; four of 16 in group 2; and six of 17 in group 3. The overall mortality was 30%. The mean units of blood replaced and the mean duration of bleeding for the groups were not significant. Analysis by linear regression showed no significant correlation between the mean age of the plasma in 45 patients in whom it could be determined and the units of blood replacement or the duration of bleeding. No correlation was found between the age of RBC and the units of cells replaced or the duration of bleeding. The frequency of hepatic coma and functional renal failure and the need for further intervention to stop bleeding were similar for the three groups. The mortality in patients with severe coagulation defects (seven of 10) was significantly greater than in those without severe coagulation defects (eight of 40). It is concluded that the failure to correct these coagulation abnormalities might provide an explanation for the inability of any of the blood replacement schedules to demonstrate a clinical advantage.

7727 ACUTE POSTOPERATIVE PERICARDITIS IN TWO CASES OF PRIMARY BILIARY CIRRHOSIS. *(Fr.)* Delmont, J.; Lafon, J.; Cassuto, P.; Rampal, P. (Cent. Hepato-Gastro-Enterol., Nice, France). *Ann. Gastroenterol. Hepatol.* 11(2):99-108, 1975.

Acute post-operative pericarditis was observed in two patients with primary biliary cirrhosis on the third and ninth days following a surgical procedure (bone biopsy, portacaval anastomosis). The patients exhibited pain in the pericardial region, elevation of temperature and typical alteration in electrocardiograph readings. The possibility of auto-immune etiology of these cases of pericarditis was indicated by: negative rheumatism, collagen, viral and allergic tests, the presence of anti-heart antibodies, the spectacular effect of corticotherapy and the striking similarity between these two cases and immunologic pericarditis of post-pericardiotomy syndrome and Dressler syndrome. It is suggested that strict cardiological monitoring of these patients, particularly after surgery, might lead to an understanding of this cause-effect relationship.

7728 CONTROLLED TRIAL OF AN ANABOLIC AGENT IN CIRRHOTICS. *(Fr.)* Nusinovici, V.; Lageron, A.; Gateau, P.; Hecht, Y.; Caroli, J. (Hopital Saint-Antoine, 184, rue du Faubourg Saint-Antoine, 75571 Paris Cedex 12, France). *Sem. Hop. Ther.* 50(9):593-594, 1974.

The effect of stanozolol, an alkylized synthetic anabolizing steroid in C 17 α, was studied on cirrhotics. Clinical and biological studies were run on 15 treated cirrhotics (group 1a) and 13 nontreated cirrhotics (group 2a). The average length of the study was 90 days for group 1a and 120 days for group 2a. The prescribed doses of stanozolol were a function of change in the patients' conditions. The total dose was between 1 and 2.5 g. No other therapy was used. Tests performed were determinations of: BSP, total bilirubin, SGPT, serum phospatases, accelerin, albuminemia, plasmotic mass, mass of circulating albumin and gammaglobulins. Autoradiographic studies were performed on five cirrhotics treated by 50 mg of stanozolol/day for 1 mo (group 1b) and on six cirrhotics receiving neither anabolizers, corticoids, or vitamin-therapy (group 2b). Three hepatic biopsies were performed to study tritiated uridine and tritiated thymidine incorporation. The clinical and biological evolution was better in group 1a than in 2a. Two parameters were significantly improved: the mass of circulating albumin and accelerin. The autoradiographical studies showed consistent similarity between groups 1b and 2b in RNA study. Stanozolol appears to be a low-risk, satisfactory treatment for hepato-cellular insufficiency in cirrhosis.

7729 REVERSIBILITY OF EXTENSIVE LIVER DAMAGE IN GALACTOSEMIA. *(E.)* Applebaum, M. N.; Thaler, M. M. (Dept. Pediatrics, Univ. California, 3rd Ave. and Parnassus St., San Francisco, Calif. 94143). *Gastroenterology* 69(2):496-502, 1975.

A case report was presented illustrating the complete recovery of normal hepatic histology after extensive liver damage in a female infant with galactosemia. Examination of the infant prior to treatment revealed a 1 kg weight loss (birth weight, 4 kg) by 14 days of age, and by 28 days of age, a failure to thrive, hepatomegaly and jaundice were observed. Galactosemia was confirmed by the absence of galactose-1-phosphate uridyltransferase activity in the RBC. Percutaneous liver biopsy revealed distorted hepatic architecture: extensive periportal and intralobular fibrosis, ductular dysplasia, "pseudoglandular" transformation (liver cells arranged in acinar formation around a central space usually filled by a bile plug), distortion of periportal vasculature, and cells with prominent fatty deposits. A galactose-free diet was instituted. Symptoms disappeared within a few days and by 3 mo, clinical and biological evidence of liver disease disappeared. At 5 mo, a second biopsy revealed no evidence of fibrosis, fatty change or lobular disarray. These findings demonstrate that functional and histologic abnormalities associated with cirrhosis can be completely reversed by dietary management in galactosemia; however, early diagnosis and immediate exclusion of galactose from the diet are necessary.

7730 DISORDERS IN IRON METABOLISM IN ALCOHOLIC CIRRHOSIS. *(Fr.)* Terasse, J.; Moinade, S.; Jarrige, J. C. (Med. Clin. B., Clermont-Ferrand, France). *Rev. Fr. Gastroenterol.* (102):39-42, 46, 1974.

In a group of 82 alcoholics (68 men and 14 women), blood iron concentrations were increased in 23 of the men (33.8%) and in seven of the women (50%). The siderophyllin saturation coefficient (normal, 33%) was above 45% in seven of the women (50%) and in 31/66 men (45%), but siderophyllin concentrations were decreased (below 1800 mg) in 78% of these alcoholics. Disorders in iron metabolism appeared to be more pronounced in 59 patients with decompensated cirrhosis than in 15 with initial clinical and biological signs of cirrhosis or in eight with large alcohol intakes but no clinical or biological evidence of cirrhosis. The mean blood iron concentration and siderophyllin saturation coefficient were increased and the mean blood siderophyllin concentration was decreased in 11 patients with bronzed skin. Endocrine disorders and disorders in the regulation of sugar metabolism were diagnosed in five of these patients, but no liver biopsies were performed so that a diagnosis of hemochromatosis could not be confirmed. Endocrine disorders were diagnosed in 34 of the cases; in 20 of these they were associated with impotence or amenorrhea. Disorders in the regulation of sugar metabolism were found in 51.2% of these patients; 26% had manifest diabetes and 25% had latent diabetes. Very few liver biopsies were performed since many of these patients had very low prothrombin levels. No relation was found between abnormalities in iron metabolism and the endocrine disorders or latent or manifest diabetes.

7731 PRIMARY BILIARY CIRRHOSIS. *(Ger.)* Kuhn, H. A. (Aus der Medizinischen Universitatsklinik, Wurzburg, Germany). *Ergeb. Inn. Med. Kinderheilkd.* 35:1-41, 1974.

7732 HEMORRHAGIC CRUVEILHIER-BAUMGARTEN'S CIRRHOSIS TREATED BY OMPHALO-CAVAL ANASTOMOSIS. ELEVEN YEAR FOLLOW UP. *(Fr.)* Vaillant, J.; Goyer, B.; Juillard, J.; Ronceray, J.; Caron, J.; Lhoste, Ph. (Clinique Saint-Martin-la-Foret, 49-Angers, France). *J. Chir.* 108(5):441-448, 1974.

7733 EXTRAHEPATIC PORTAL HYPERTENSION WITH PULMONARY HYPERTENSION IN A 22-YEAR-OLD WOMAN. *(Cz.)* Brozman, M.; Jakubovsky, J. (Univ. Komenskeho, Bratislava, Czechoslovakia). *Bratisl. Lek. Listy* 63(2):159-166, 1975.

7734 THE EFFECTS OF β-ADRENERGIC BLOCKADE ON CIRRHOTIC ASCITES. *(E.)* Panitch, N. M.; Cole, D.; Samloff, I. M.; Horton, R. (Harbor Gen. Hosp., Torrance, Calif.). *Gastroenterology* 68(4):965, 1975.

7735 ALPHA-1-ANTITRYPSIN DEFICIENCY LIVER DISEASE IN AN ADULT. *(E.)* Leach, B. E.; Slay, F. M.; Voorhies, N. W. (South. Baptist Hosp., New Orleans, La.). *Gastroenterology* 68(4):933, 1975.

7736 VALIDITY OF ANTIMITOCHONDRIAL ANTIBODY (AMA) TEST IN PRIMARY BILIARY CIRRHOSIS (PBC): STUDIES OF REAGENT VARIABLES. *(E.)* Winter, S. L.; Kraft, S. C.; Boyer, J. L. (Dep. Med., Univ. Chicago, Chicago, Ill.). *Gastroenterology* 68(4):929, 1975.

7737 DOUBLE-BLIND POLYCENTRIC STUDY ON THE ACTIVITY OF SULPHO-ADENOSYL-L-METHIONINE IN HEPATIC CIRRHOSIS. *(It.)* Labo, G.; Miglio, F.; D'Ambro, A.; Bellobuono, A.; Ideo, G.; Dioguardi, N.; Avogaro, P.; Pasquino, M. (2nd. Dep. Med., Univ. Bologna, Venice, Italy). *Minerva Med.* 66(33):1590-1594, 1975.

7738 S-ADENOSYL-METHIONINE: PLASMA LEVELS IN HEPATIC CIRRHOSIS AND FIRST RESULTS WITH ITS CLINICAL USE IN HEPATOLOGY. DOUBLE-BLIND STUDY. *(It.)* Ideo, G. (3rd. Dept. Medicine, Univ. Milan, Milan, Italy). *Minerva Med.* 66(33):1571-1580, 1975.

7739 THERAPEUTIC ACTIVITY OF SULPHO-ADENOSYL-METHIONINE IN SOME CHRONIC HEPATOPATHIES. *(It.)* Labo, G.; Gasbarrini, G. B. (2nd Dept. Medicine, Univ. Bologna, Bologna, Italy). *Minerva Med.* 66(33):1563-1570, 1975.

7740 SERUM IMMUNOGLOBULINS IN CHRONIC LIVER DISEASE IN CHILDREN. *(Rus.)* Fokina, T. V.; Chistova, L. V. (Inst. Pediatrics, Moscow, USSR). *Pediatriia* (3):52-57, 1975.

7741 PLASTICITY OF THE LYMPHATIC BED OF THE HUMAN ESOPHAGEAL WALL IN CIRRHOSIS. *(Rus.)* Borisov, A. V.; Shipulin, A. N. (Leningrad Medical Inst. Sanitation Hygiene, USSR). *Arkh. Patol.* 37(3): 47-51, 1975.

7742 EVALUATION OF HEPATIC ENCEPHALOPATHY IN PORTACAVA SHUNTS AND MESENTERICO-CAVA BY-PASS WITH THE JUGULAR VEIN. *(It.)* Thau, A.; Bucci, L.; Ziparo, V.; Schillaci, A. (1st Sch. Semeiotic Surgery, Univ. Rome, Rome, Italy). *Minerva Chir.* 30(8):449-453, 1975.

7743 DOUBLE-BLIND TRIAL ON THE THERAPEUTIC ACTIVITY OF SAMe, ADMINISTERED PER OS, IN HEPATIC CIRRHOSIS AND CHRONIC HEPATITES [SIC]. *(It.)* Miglio, F.; Stefanini, G. F.; Corazza, G. R.; D'Ambro, A.; Gasbarrini, G. (Dep. Medical Pathol., Univ. Bologna, Bologna, Italy). *Minerva Med.* 66(33):1595-1599, 1975.

7744 HEPATITIS B ANTIGEN IN PATIENTS WITH CHRONIC LIVER DISEASES. *(Ser.)* Julijana, M.; Filipovic, D.; Stajic, M. (Mother Child Health Inst. Serbia, Belgrade, Yugoslavia). *Med. Pregl.* 27(9-10): 395-398, 1974.

7745 HEPATIC ENCEPHALOPATHY: CLINICAL ASPECTS AND TREATMENT. *(Rum.)* Mardare, G. (Institutul de Medicina si Farmacie, Jassy, Rumania). *Rev. Med.-Chir.* 78(3):559-564, 1974.

7746 AUSTRALIA ANTIGEN IN CIRRHOSIS. A STUDY OF 100 CASES IN GREECE. *(Fr.)* Yannitsiotis, A.; Schizas, N.; Lalos, J. (Hopital des Assurances Sociales 1.K.A. "Pendelli", Melissia-Athenes, Greece). *Ann. Gastroenterol. Hepatol.* 11(2):135-141, 1975.

7747 CHANGES ON RETROGRADE CHOLANGIOGRAMS IN PRIMARY BILIARY CIRRHOSIS OF THE LIVER. *(Ger.)* Safrany, L.; Ambrus, C.; Barna, L.; Buki, B.; Magyar, I.; Szalay, F. (I. Medizinischen klinik, Semmelweis-Universitat, Budapest, Hungary). *Fortschr. Rontgenstr.* 120(3):258-263, 1974.

7748 THE FREQUENCY OF CIRRHOSIS IN THE "HOSPITAL DE CLINICAS DE BUENOS AIRES" (1900-1969). *(Sp.)* Koch, O. R.; De Garcia, I. A. (Dept. Medicine, Univ. Buenos Aires, Buenos Aires, Argentina). *Acta Gastroenterol. Latinoam.* 6(2):63-68, 1974.

7749 MANAGEMENT OF THE PATIENT WITH LIVER CIRRHOSIS IN MEDICAL PRACTICE. *(Ger.)* Kinzlmeier, V. H. (St. Rochus-Krankenhaus, Bad Mergentheim, Germany). *Fortsch. Med.* 93(2):43-48, 1975.

7750 BLEEDING ESOPHAGEAL VARICES. *(Sw.)* Ascherg, S. (Dept. Surgery, Serafimer Hosp., Stockholm, Sweden). *Lakartidningen* 71(49):5063-5070, 1974.

7751 PORTAL OBSTRUCTION WITHOUT CHANGE IN HEPATIC PARENCHYMA. TWO CASES OF MESENTERICO-CAVAL BY-PASS. LATE RESULT—RECENT TECHNIQUE. *(Fr.)* Goux, J. P.; Lauron, G.; Bus, J. J.; Barraya, L. (No affiliation given). *Chirurgie* 101(1):35-41, 1975.

See also, 6892, 6997, 7046, 7584, 7586, 7588, 7621, 7659, 7684, 7690, 7692, 7694, 7697, 7701, 7714, 7879.

LIVER AND BILIARY TRACT

Gallbladder and Biliary Tract Diseases

7752 CANCER OF THE BILE DUCT: THE OCCULT MALIGNANCY. *(Eng.)* Wanebo, H. J.; Grimes, O. F. (Univ. California Medical Cent., San Francisco, Calif. 94122). *Am. J. Surg.* 130(2):262-268, 1975.

A group of 51 patients (30 men and 21 women, average age 61 yr) with bile duct cancer were studied. The mean duration of symptoms was 8 mo. Major symptoms included abdominal pain, jaundice, pruritus, anorexia and weight loss. Jaundice, hepatomegaly, abdominal mass, and ascites were prominent signs. The laboratory findings indicated obstructive jaundice. Percutaneous transhepatic cholangiograms indicated obstruction in the biliary system. Operative cholangiograms *via* some portion of the extrahepatic ductal system, though frequently made, did not often diagnose malignant disease. The reasons for this lack of recognition of bile duct cancer in one third of 45 patients undergoing initial laparotomy for clinical biliary tract obstructive disease were varied. The location of the tumor included the common duct or distal common duct in 17 patients, the junction of the cystic duct with the common duct in three, the cystic duct in three and the common hepatic duct in 13. Carcinoma was found in the right intrahepatic duct in four, and in the left hepatic duct in two, in both ducts in one and at the duct junction in eight. Obvious metastases to regional lymph nodes occurred in eight patients and metastases or extension to the liver occurred in 12. The operative mortality was 24%. The overall survival from onset of symptoms in patients who successfully underwent some type of surgery was 19.4 mo. Major postoperative complications occurred in 11 patients including external biliary fistula (two cases), acute cholangitis (two), hepatorenal syndrome (one), liver failure with cirrhosis (one), hemorrhagic shock with portal hypertension (one), thrombophlebitis with pulmonary emboli requiring ligation of the inferior vena cava (one), hemorrhagic gastritis (one), toxic brain syndrome (one) and wound infection (one). It is suggested that in order to detect these tumors more frequently during exploration of the extrahepatic biliary system, especially during cholecystectomy, biopsy specimens of any indurated area should be taken. The discovery of white bile in the common duct is highly suggestive of a malignant disease.

7753 ACTH-SECRETING 'APUDOMA' OF GALLBLADDER.

(E.) Spence, R. W.; Burns-Cox, C. J. (Frenchay Hosp., Bristol, England). *Gut* 16(6):473-476, 1975.

The case of a 44-yr-old woman with an ACTH-secreting carcinoma of the gallbladder is reported. The patient presented with features of Cushing's syndrome (facial plethora and hirsutes, an obese abdomen with striae, bruising, and obvious quadricep wasting). The liver was enlarged and palpable; serum alkaline phosphatase was 245 IU/liter. The patient also had two episodes of electrolyte imbalance. A dexamethasone suppression test demonstrated high basal levels of urinary cortisol precursors and derivatives; and two days of dexamethasone administration at 2 mg/day followed by two days at 8 mg/day showed a marked increase in cortisol derivatives and precursors and in adrenal androgens. Plasma cortisol and plasma ACTH (161 μg/ml) levels were also elevated. A metyrapone test two weeks later showed even higher basal steroid levels, and six 750 mg doses of metyrapone over 24 hr did not produce any significant alterations. At laparatomy, a large secondary tumor was found in the liver and a tumor was present in the gallbladder wall occluding Hartmann's pouch. Cytochemical evaluation of the hepatic tumor after death gave strongly positive enzyme reactions characteristic of amino precursor uptake and decarboxylation cells. Immunofluorescent studies with various antisera gave a positive reaction only with ACTH antiserum. Postmortem examination confirmed that the tumor had arisen from the wall of the gallbladder or cystic duct. This is apparently the first reported case of an ectopic hormone-producing tumor of the gallbladder.

7754 THE SEPARATION AND CHARACTERIZATION OF LIVER PLASMA MEMBRANE FRAGMENTS CIRCULATING IN THE BLOOD OF PATIENTS WITH CHOLESTASIS.

(E.) De Broe, M. E.; Borgers, M.; Wieme, R. J. (Univ. Hosp., 9000 Gent, Belgium). *Clin. Chim. Acta* 59(3):369-372, 1975.

Further studies were made of the doublet of alkaline phosphatase (AP) isozymes occurring in the serum of patients with cholestasis. The doublet had been characterized earlier by the simultaneous presence of a conventional liver AP and of a high-molecular weight isozyme, with a rapid migration pattern in agar gel electrophoresis (R fraction). Due to the possibility that the liver AP was associated with fragments of liver cell membranes, experiments were conducted to isolate this complex from serum. Satisfactory isolation of the R fraction complex was obtained. This material was checked for the presence of typical plasma membrane-bound enzymes and the following activities were demonstrated: AP (using paranitrophenyl phosphate), 5'-nucleotidase (using adenosine 5'-monophosphate), γ-glutamyl transpeptidase (using *N*-γ-L-glutamyl-α-naphthylamide), and L-leucyl-β-naphthylamidase (using leucine-*p*-nitranilide). The following enzymes were absent: SGPT, SGOT, lactate dehydrogenase, and acid phosphatase. Testing indicated this macromolecular complex was not identical to and did not contain the lipoprotein X. The demonstration of several other membrane-bound enzymes in the isolated complex suggests either a marked heterogeneity of the material, or a basic structural feature indicating a close relation to liver cell plasma membranes. Biochemical and electron-microscopic demonstration of the vesicular nature of this R fraction suggests that fragments of liver plasma membrane appear and continue to circulate in the blood of patients in an early stage of cholestasis.

7755 KINETICS OF CHOLESTEROL AND BILE ACIDS IN PATIENTS WITH CHOLESTEROL CHOLELITHIASIS.

(E.) Hepner, G. W.; Quarfordt, S. H. (Milton S. Hershey Medical Center, Pennsylvania State Univ., Hershey, Pa. 17033). *Gastroenterology* 69(2):318-325, 1975.

Kinetic studies of cholesterol and bile acids were performed on six Caucasians with cholesterol cholelithiasis (CC) and six healthy matched controls to determine the *in vivo* conversion of cholesterol to bile acid. The rate of biliary neutral sterol loss was also obtained. A 10-wk analysis of biliary lipids after a single injection (10-20 μCi) of labeled cholesterol was conducted in conjunction with a conventional 1-wk study of primary bile acid kinetics. During this period, samples of duodenal bile were taken daily for the first four days after injection and then on days 7, 10, 13, 18, 21, and weekly thereafter for the duration of the experiment. Kinetic values of two of six CC subjects were very similar to the controls. The remaining four CC patients showed smaller primary bile acid pools, significantly lower fractional conversions of cholesterol to both primary bile acids (λ31, λ41) with concomitantly lower bile acid flux, and a more gradual bile acid specific activity decay after the maximum. No significant differences were observed in the fractional conversion rate of rapidly miscible cholesterol pool (RMF) to total primary bile acid ($\lambda 31$, $\lambda 41$), fractional rate of loss and flux of biliary neutral sterol, or the fractional turnover of the primary acid pools of cholate ($\lambda 03$) and chenodeoxycholate ($\lambda 04$). The heterogeneity of the six patients suggests multifactorial processes in the pathogenesis of CC. It is possible that the two patients with kinetics similar to the controls may have had pigment stones rather than CC (diagnosis was made by observation of radiolucent stones; pigment stones were not differentiated from CC). This study suggests that RMP cholesterol conversion to primary bile acids may be defective in Caucasian CC patients with small primary bile acid pools. This defect may be due to an absolute deficiency in the hepatic content of 7α-hydroxylase, the rate-limiting enzyme for bile acid synthesis.

7756 CHENODEOXYCHOLIC ACID THERAPY FOR GALLSTONES: EFFECTIVENESS, TOXICITY AND INFLUENCE ON BILE ACID METABOLISM. *(E.)* James, O.; Cullen, J.; Bouchier, I. A. D. (Royal Free Hosp., London, England). *Q. J. Med.* 44(174):349-367, 1975.

The results of chenodeoxycholic acid treatment in 13 patients with various biliary tract disorders are reported. The biliary lipid and bile acid composition were measured before and during treatment in all patients. Bile acid pool size was determined before and during treatment in eight patients with gallstones. The patient group studied included six cases with small radiolucent stones (0.5 cm) and a functioning gallbladder, two with large radiolucent stones and a functioning gallbladder, two with radiolucent stones and a nonfunctioning gallbladder, and three with biliary stricture and recurrent cholangitis. Patients received chenodeoxycholic acid (1 g/day) for eight to ten months (gallstone patients) or for two to eight months. Of the ten patients with gallstones, four showed marked dimunition or disappearance of the stones following therapy. Of the six patients with multiple small radiolucent stones, three showed marked diminution or disappearance of stones after one-yr of treatment. Of three cases with biliary stricture, one received treatment for only two months and results were not conclusive. During the first six months of therapy in the other two, the number of cholangitis attacks fell from 24 to six and from 20 to five, resp., over a six-month period. There was a significant elevation in serum bile acid levels in eight gallstone patients, from a mean of 28.8 μM/liter before to a mean of 8.6 μM/liter after treatment. A liver biopsy in eight gallstone patients showed minor changes, including fatty vacuolation and siderosis in three, portal tract sclerosis in two, and portal tract and duct infiltration in one. There was no significant change in biliary lipid composition. Changes in biliary bile acid composition and bile acid pool sizes were variable and could not be correlated with the clinical results. These and previous results suggest that the varying effects of chenodeoxycholic acid treatment may be explained by a balance between the effects of reducing cholesterol synthesis and the variable expansion of the bile acid pool size from exogenously administered chenodeoxycholic acid. A further clinical trial is recommended.

7757 CHENODEOXYCHOLIC ACID TREATMENT OF GALLSTONES. A FOLLOW-UP REPORT AND ANALYSIS OF FACTORS INFLUENCING RESPONSE TO THERAPY. *(E.)* Iser, J. H.; Dowling, R. H.; Mok, H. Y. I.; Bell, G. D. (Guy's Hosp., London, SE1 9RT, England). *N. Engl. J. Med.* 293(8):378-383, 1975.

Seventy patients (15 men and 55 women, aged 24-76 yr) with gallstones were treated with chenodeoxycholic acid over a period of 3½ yr. Factors influencing the outcome of such therapy were analyzed. In 11 patients with radiopaque gallstones and in seven with nonfunctioning gallbladders, this treatment was not successful. Of the patients with radiolucent gallstones treated for six months or more, 64% showed partial or complete gallstone dissolution. Of those whose bile became unsaturated with cholesterol, 100% had evidence of dissolution. In patients with some degree of gallstone dissolution, the mean post-treatment biliary cholesterol saturation index was significantly less and the dose of chenodeoxycholic acid (14.4 mg/kg/day) significantly more than in those patients whose gallstones did not undergo any change. The results of this study show that chenodeoxycholic acid treatment should be confined to patients with radiolucent gallstones and functioning gallbladders. The dose should be based on body weight with a suggested dose of 14 to 15 mg/kg/day. The response to treatment should be confirmed by bile lipid analysis one to three months after start of treatment. If the treatment has resulted in an unsaturated bile, small radiolucent gallstones should show partial or complete dissolution within 12 months. Medium or large gallstones should give evidence of dissolving within two yr. Careful monitoring of liver function and assessment of liver structure is advisable in view of the slight changes in serum transaminase levels which have been observed.

7758 MALIGNANT PAPILLOMATOSIS OF THE EXTRAHEPATIC BILIARY TRACT. *(Ger.)* Adolphs, H. D.; Schlachetzki, J.; Breining, H.; Karhoff, B. (Marien Hosp., Aachen, Germany). *Med. Klin.* 69(46):1899-1902, 1974.

A 52-yr-old woman who had been hospitalized 1 yr previously for upper abdominal pain developed occasional diarrhea with acholic stools, dark urine and jaundice. SGOT, SGPT, alkaline phosphatase, and leucine aminopeptidase activities were increased, as was the relative percentage of α_2- and β-globulins. The biliary tract was not visualized on i.v. cholangiography. In spite of administration of *N*-butylscopolammonium bromide, total serum bilirubin values continued to increase to 11.4 mg/100 ml. When the common bile duct was opened at laparotomy, gelatinous, papillomatous masses emerged. Removal of these masses with a scoop and by aspiration provided good bile flow into the duodenum. Histological examination of the masses showed nuclear atypia but no evidence of infiltrative growth in any of the tissue obtained at surgery. A liver biopsy showed severe cholestasis with chronic cholangitis and pericholangitis evolving into cholangiohepatitis. The patient recovered uneventfully after surgery but was readmitted with a recurrence 3 months later. After surgical removal of the papillomatous masses and aspiration and curretage of the entire biliary tract, a choledochoduodenostomy was performed so that these masses could drain into the duodenum without interfering with bile flow. Again, histological examination of the masses failed to show evidence of infiltration. The patient was hospitalized for a second recurrence 10 months later, at which time ascites were also present. Carcinoma cells were found in the ascitic fluid on paracentesis. After symptomatic drug therapy, the patient was discharged, but died 6 months later from bronchopneumonia. At autopsy, the bile ducts were filled with papillomatous masses which completely plugged the choledochoduodenostomy; still no evidence could be obtained of infiltration into the walls of the bile ducts. Examination of the liver revealed purulent intrahepatic cholangitis, biliary cirrhosis, and multiple abscesses. One of these abscesses had perforated the capsule of the liver and produced subphrenic empyemia and peritonitis. No signs of intestinal polyposis were found. In contrast to two previously described cases of biliary papillomatosis, the rapidly progressive course and severe degree of cachexia in this patient are regarded as evidence of malignancy.

7759 OBSTRUCTIVE JAUNDICE IN PATIENTS WITH PANCREATITIS WITHOUT ASSOCIATED BILIARY TRACT DISEASE. *(E.)* McCollum, W. B.; Jordan, P. H. (Baylor Coll. Medicine, Houston, Tex.). *Ann. Surg.* 182(2):116-120, 1975.

Seven cases of obstructive jaundice in patients with pancreatitis without associated biliary tract disease are presented; the differential diagnosis between benign and malignant diseases is discussed. Case 1 was a diabetic, alchoholic man who had painless jaundice of four weeks duration. A distal pancreatectomy with pancreaticojejunostomy and decompression of the biliary system was performed. The pancreas removed at operation revealed chronic pancreatitis and no cancer. The patient died in 3 mo with disseminated carcinoma of the pancreas. This patient illustrated the difficulty of distinguishing between cancer and pancreatitis in the presence of painless jaundice and emphasized the fact that these conditions may coexist. Case 2 was a 38 year-old alcoholic with painful jaundice of 1 mo duration. The diagnostic dilemma in this patient was whether his juandice was related to intrahepatic disease due to alcoholism or to extrahepatic obstruction due to common duct stone, pancreatic inflammation or cancer. A pancreaticojejunostomy was performed. The patient lived and was well for 6 yr, and then died from respiratory and hepatic insufficiency. This fact provided evidence that pancreatitis rather than cancer was the correct diagnosis. Case 3 was a 76 year-old diabetic with painless jaundice for 6 mo. He was diagnosed as having acute and chronic pancreatitis. A distal pancreatectomy with pancreaticojejunostomy and cholecystojejunostomy were performed. This patient was over-treated and could have been managed by simple decompression of the biliary tree alone. Case 4 was a 44-yr-old diabetic, alcoholic patient with pancreatitis and cholelithiasis. A cholecystectomy, sphincterotomy and longitudinal jejunostomy were performed. Due to the continued intake of alcohol, pancreatitis progressed and a choledochogastrostomy was performed 1 yr later. He was still doing well after 7 yr. Patients 5 and 6 had pancreatic pseudocysts. Decompression of the pseudocyst immediately relieved the obstructive jaundice in the first patient but not in the second. Case 7 developed postoperative acute pancreatitis following a vagotomy and partial gastrectomy. He died following his third operation, which was required to drain an abcess on the pancreas. In conclusion, the differential diagnosis between benign and malignant diseases is extremely difficult in patients with painless, obstructive jaundice due to pancreatitis.

7760 COAGULATING EFFECT ON CALCIUM CARBONATE OF SULFATED GLYCOPROTEINS ISOLATED FROM PATHOLOGICAL BILE. *(E.)* Nagashima, H.; Suzuki, N.; Yosizawa, Z. (Tohoku Univ. Sch. Med. Sendai, Japan). *Tohoku J. Exp. Med.* 113(2):159-168, 1974.

Normal human biles and pathological biles from 2 patients who had undergone surgery for intrahepatic gallstones were fractionated centrifugally in the presence of salts. The coagulating effects of the resulting fractions on calcium carbonate suspension in water were then determined. Three of 6 fractions obtained from pathological bile had a coagulating effect, whereas no noticeable coagulating effect was found with fractions from normal bile. The major fraction (Fr. 2) from pathological bile coagulated the calcium carbonate suspension at a low concentration (%) of 10^{-3}. Further fractionation of Fr. 2 on DEAE-Sephadex A-25 yielded several subfractions, 3 of which caused remarkable coagulation at concentrations (%) between 5×10^{-4} and 5×10^{-3}. Fr. 2 and its active subfractions were characterized as sulfated glycoproteins by chemical analysis. Normal bile contained no sulfated glycoprotein. The data support previous findings suggesting that sulfated glycoproteins in bile are responsible for gallstone formation.

7761 BY-PASS ANASTOMOSIS OF INTRAHEPATIC DUCT TO THE GALLBLADDER. *(E.)* Scanlon, E. F.; Oviedo, M. A. (Evanston Hosp., Evanston, Ill.). *J. Surg. Oncol.* 7(4):319-322, 1975.

A procedure is reported to relieve a malignant obstruction of the extrahepatic bile duct. A 61-year-old man was admitted with adenocarcinoma of the sigmoid colon. The postoperative course was uneventful, but one yr later the patient was readmitted with severe jaundice. A percutaneous hepatic cholangiogram showed complete obstruction of proximal hepatic duct. A biliary anastomosis was attempted using the gallbladder and patent cystic duct as bypass circuit. One branch of a T-tube was inserted into the bile duct and the other branch into the gallbladder; the long limb of the T-tube was brought out to the skin. The T-tube worked postoperatively but the patient expired two months later. Postmortem revealed massive replacement by the liver by metastasis from the adenocarcinoma; the bypass remained intact. This procedure is indicated if the gallbladder-cystic duct is patent and if the patient is not a candidate for radical curative procedures.

7762 POLYMICROBIAL SEPSIS FOLLOWING ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY.

(Eng.) Elson, C. O.; Hattori, K.; Blackstone, M. O. (Univ. Chicago Pritzker Sch. Medicine, Box 400, 950 E. 59th Street, Chicago, Ill. 60637). *Gastroenterology* 69(2):507-510, 1975.

Cholangitis with polymicrobial sepsis followed an endoscopic retrograde cholangiopancreatography (ERCP) performed in a 54-yr-old woman without extrahepatic obstruction. Eighteen hr after ERCP, the patient developed a 40 C fever, right upper quadrant pain and tenderness. Blood cultures grew *Pseudomonas aeruginosa* and *Enterobacter aerogenes*. ERCP equipment was examined and found to be the source of the infection. *Pseudomonas* and enterobacteriaceae flourished in the equipment after the standard disinfection procedure of soap, water, and 70% alcohol. Following a 2% gluteraldehyde disinfection procedure, only mouth flora were cultured. Prevention of ERCP-related sepsis through more effective instrument disinfection is suggested.

7763 THE NEGATIVE CHOLECYSTOGRAM IN GALLBLADDER DISEASE.

(Eng.) Reid, D. R. K.; Rogers, I. M. (Royal Glasgow Infirmary, Glasgow, Scotland). *Br. J. Surg.* 62(7):581-583, 1975.

Seventeen patients (two men and 15 women, aged 21-70 yr) are presented who suffered from typical, severe, and recurrent biliary colic. In each of these patients, on at least one occasion, cholecystography findings were negative. The cholecystogram was repeated several times in six patients, and in three instances a normal i.v. cholangiogram was obtained. One patient had one normal cholecystogram and one normal i.v. cholangiogram. The cholecystogram was abnormal on one occasion in four patients. In two patients normal findings became abnormal over five and 11 yr, resp., while the symptoms remained the same. In the two other cases, abnormal cholecystogram initially became normal after three and nine months, resp. The duration of symptoms ranged from six months to 25 years, with an average of 7.5 yr. In each case there was an observation of at least several months before a final diagnosis was made. The major symptom in each case was pain, typical in nature and lasting from several hr to several days. Transitory jaundice occurred in five patients, and in one patient six times. Of these five, two had cholesterol stones in the gallbladder, one had biliary mud and two had no stones at operation. "Subclinical" jaundice developed in three patients, both with and without stones at operation. The frequency of jaundice and cholecystitis were nearly the same in the group of nine patients with stones and the group of eight patients without stones at operation. The symptoms in these patients were explained on the basis of "disappearing stone". Both groups were totally relieved of the attacks of pain by cholecystectomy and the postoperative follow-up was similar. It is suggested that cholecystectomy be considered in patients such as these provided the symptoms are sufficiently characteristic and severe.

7764 CLASSIFICATION OF CHOLEDOCHODUODENAL FISTULA DIAGNOSED BY DUODENAL FIBERSCOPY AND ITS ETIOLOGICAL SIGNIFICANCE.

(E.) Ikeda, S.; Okada, Y. (First Dep. of Surgery, Kyushu University, Fukuoka, Japan). *Gastroenterology* 69(1):130-137, 1975.

Two types of choledochoduodenal fistulas were studied with duodenal fiberscopy and endoscopic cholangiography. Of 146 patients with cholelithiasis, choledochoduodenal fistulas were diagnosed in 20. Type I fistula was usually present on the longitudinal fold just orad to the papillas; it was small and arose from the intramural portion of the slightly enlarged common bile duct. Type II fistula was present at the duodenal mucosa adjacent to the longitudinal fold; it was large and arose from the extramural portion of the highly dilated common bile duct. Type I was found in 8 of 20 cases and type II in 12 of 20 cases. Type I fistulas are postulated to be caused by the impaction of a gallstone too large to pass the duodenal papilla. Type II fistulas are caused by a gallstone too large to enter the common bile duct and therefore impacted into the extramural portion. The recent introduction of the duodenal fiberscope and cholangiography have made the diagnosis of choledochoduodenal fistulas easier and more reliable.

7765 VALUE OF LAPAROSCOPY IN HEPATOBILIARY DISEASE

(E.) Cuschieri, A. (Dept. Surgery, University Liverpool, England). *Ann. R. Coll. Surg. Engl.* 57(1):33-38, 1975.

A prospective study was undertaken to assess the value of laparoscopy in the investigation of hepatobiliary disease. A group of 33 consecutive patients aged 25-70 yr with cholestatic jaundice had a laparoscopy immediately prior to laparotomy in order to compare the diagnostic yield between laparoscopy with that of laparotomy and operative choledochography. Pathology was accurately diagnosed by laparoscopy alone in 21 of 33 cases. Laparotomy and operative choledochography made the diagnosis possible in every case. Another group of 25 patients with advanced cancer (gastrointestinal tract--14, breast cancer--nine, and bronchus--two) were investigated for hepatic involvement by secondary tumor using both laparoscopy and hepatic scintiscanning with ^{99m}Tc-sulfocolloid. Laparsocopy gave a slightly better diagnostic yield (28%) for secondary tumor deposits than hepatic scintiscanning (28%); the combined use of both methods reduced the false negative rate to 11%. Laparoscopic liver biopsy was superior to blind percutaneous biopsy in the retrieval of secondary malignant tissue, but it had no obvious advantage over the latter in patients with diffuse disease (cirrhosis) or primary hepatic tumors.

7766 PERITONEOSCOPY IN DIFFERENTIAL DIAGNOSIS OF JAUNDICE.

(Rus.) Trofimov, V. M. (S. P. Fedorov Fac. Chir. Clin., S. M. Kirov Mil. Med. Acad., Leningrad, USSR). *Vestn. Khir.* 114(5): 45-49, 1975.

Peritoneoscopy tests (162) were performed on 158 patients (93 men and 65 women, aged 16-78) with bilirubinemia (1.5 mg% and higher). This included: 50 patients with swelling of the biliopancreatic region, bile ducts or liver; 37 patients with cirrhosis of the liver; 36 patients with various forms of hepatitis; 21 patients with gallstones; seven patients with other diseases (lymphogranulomatosis, functional hyperbilirubinemia, hemolytic jaundice and indurative pancreatitis). In seven patients, no distinct diagnosis could be established and these patients were dropped from further consideration in the study. In 74 cases, the jaundice was determined as mechanical; in 77 cases as parenchymatous. Peritoneoscopic studies revealed distinct differences in the color of the liver in both kinds of jaundice. Endoscopy gave a correct diagnosis of mechanical jaundice in 84% of the cases; it was correct in 96% of the cases of parenchymatous jaundice. It is also possible, by means of peritonescopy (judging by the appearance of the liver and gallbladder), to obtain an idea about the site and character of the thrombosis of the bile ducts.

7767 HEPATIC PORTOENTEROSTOMY (THE KASAI OPERATION) FOR BILIARY ATRESIA.

(E.) Lilly, J. R.; Altman, R. P. (Univ. Colorado Medical Center, Denver). *Surgery* 78(1):76-86, 1975.

The results of hepatic enterostomy (Kasai operation) in the treatment of 22 infants with biliary atresia over a 2 1/2 yr period are presented. Their age at operation ranged from 3 weeks to 17 months; the majority had surgery at six to 12 weeks. The diagnosis of biliary atresia was established at surgical exploration and confirmed by liver biopsy. Use was made of a long (30 cm) Roux-en-Y intestinal segment, the middle of which was exteriorized as a Mikulicz double-barrelled cutaneous enterostomy. In patients with sustained and normal volume of bile drainage and in whom transhepatic cholangiography shows unimpeded flow through the anastomosis, the intestinal spur is subsequently crushed. Bile can be collected from one stoma and instilled into the other once or twice daily. The Mikulicz enterostomy is ultimately closed by an extraperitoneal operation. There were no operative deaths. Postoperative complications arose in two patients: injury of a branch of the portal vein during surgery and a subphrenic abscess. Evidence of bile drainage after operation was seen in 11 patients, determined by reduction in serum bilirubin levels of 50% or more, by improved or normal ^{131}I-sodium Rose Bengal excretion studies, and in several cases by visualization of a functional biliary enteric anastomosis by transhepatic cholangiography. Bile drainage was not obtained in any patient older than 12 weeks nor in the absence of microscopic biliary ductules in the excised fibrotic remnant of the extrahepatic bile ducts. Ascending cholangitis occurred in all but three infants with postoperative bile drainage. Death occurred in three patients without bile drainage and in one with unrelenting cholangitis. Clinical evidence of residual and/or progressive liver disease was seen in 13 cases. Of the 22 infants, five are doing well from three months to more than two yr after surgery. It is suggested that, regardless of the complicating factor of recurrent cholangitis, hepatic enterostomy be considered for all infants with biliary atresia younger than 12 weeks at diagnosis.

7768 THE VALUE OF RADIOLOGY IN PREDICTING GALLSTONE TYPE WHEN SELECTING PATIENTS FOR MEDICAL TREATMENT.

(E.) Bell, G. D.; Dowling, R. H.; Whitney, B.; Sutor, D. J. (Royal Postgraduate Medical Sch., London, England). *Gut* 16(6):359-364, 1975.

A prospective study is presented that correlates the preoperative radiological appearance of gallstones from patients undergoing elective cholecystectomy with the composition of the stones, as measured by x-ray diffraction and chemical analysis. The influence of age and sex on gallstone was also examined. Gallstones were obtained from 57 patients (42 women and 15 men, aged 25-89 yr). All stones were analyzed by x-ray diffraction. Clinical radiographs were obtained in 50 of these; 50 stones underwent chemical analysis, and clinical radiographs were available for 47 of these. X-ray diffraction showed that gallstones from women contained more cholesterol than those from men, while stones from women under 50 yr contained approximately 15% more cholesterol than those from older women. The relative proportions of the different substances present in gallstones from both sexes were: 60%, stones with more than 95% cholesterol; 23%, mixed stones with less than 70% cholesterol; and 14%, stones composed of calcium salt crystals. Of the 50 gallstones analyzed chemically, 68% contained more than 70% cholesterol. The mean cholesterol content in stones measured chemically was 72.7%, compared with the 68.3% weight given by x-ray diffraction. Of the 47 cases in whom both radiographs and chemical analyses were available, 24 stones were radiolucent (86.2% mean cholesterol) and 23 radio-opaque (59.0% mean cholesterol). The difference in cholesterol content was statistically significant. A 20% incidence of radiographic false-positives was found in patients with small, irregular, radiolucent stones which subsequently proved to be noncholesterol-rich. Large radiolucent stones with a smooth contour were usually cholesterol-rich. These results suggest that clinical radiography provides a reliable, but not completely accurate, indication of the gallstone type present.

7769 ENDOSCOPIC SPHINCTEROTOMY OF THE AMPULLA OF VATER AND REMOVAL OF COMMON DUCT STONES.

(E.) Nakajima, M.; Kimoto, K.; Fukumoto, K.; Ikehara, H.; Kawai, K. (Kyoto Prefectural Univ. Medicine, Kyoto, Japan). *Am. J. Gastroenterology* 64(1):34-43, 1975.

The technique of endoscopic sphincterotomy for the removal of common duct stones *via* the ampulla of Vater is described. During a recent 16-mo period this procedure was used on 14 patients. After premedication with an antispasmodic agent and local anesthetic the duodenofiberscope was passed into the duodenum and the tip of the electrode was introduced into the ampulla through the biopsy channel. The free end of the electrode was connected to a diathermic unit and a blended current was used for cutting and coagulation to section the sphincter. Two types of basket-tipped catheters have been devised for extraction of stones. This procedure was accomplished in 11 of 14 patients without bleeding, perforation or complications. Short term follow-up indicated no remarkable changes in liver and pancreatic functions. Secondary inflammation of the bile duct and secondary pancreatitis have not been encountered. The clinical history and treatment of one case was described in detail. It is stressed that this method cannot replace surgical sphincterotomy because the anatomic sphincteric mechanism is not completely sectioned.

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7771 ANOMALIES IN THE POSITION OF THE GALLBLADDER: REPORT OF ONE CASE. *(Fr.)* Pannier, M.; Leborgne, J.; Visset, J.; Barbin, J.-Y. (U.E.R. de Medecine, 1, rue Gaston-Veil, F. 44000, Nantes, France). *Arch. Anat. Pathol.* 22(4):267-270, 1974.

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7836 RECURRENT WOUND SINUSES AFTER CHOLECYSTECTOMY FOR Salmonella paratyphi. *(E.)* Tuononen, S.; Klintrup, H.-E.; Mokka, R. (Dept. Surgery, Univ. Oulu, Oulu, Finland). *Ann. Chir. Gynaecol. Fenn.* 64(1):22-23, 1975.

7837 VARIETIES OF SCLEROSING CHOLANGITIS. SURGICAL SIGNIFICANCE. *(E.)* Grodsinsky, C.; Block, M. A.; Brush, B. E. (Henry Ford Hosp., 2799 W. Grand Blvd., Detroit, Mich. 48202). *Bull. Soc. Int. Chir.* 33(3):187-195, 1974.

7838 COMPARATIVE RESULTS OF PAPILLOSTOMY AND CHOLEDOCHO-DUODENOSTOMY FOR LITHIASIS OF THE COMMON BILE DUCT. *(E.)* Fegiz, G.; Tonelli, F. (Istituto di Patologia Chirurgie 2, Univ. Roma, Rome, Italy). *Surg. Italy* 4(1):54-61, 1974.

7839 UPPER ABDOMINAL MASS ASSOCIATED WITH JAUNDICE: A RARE FORM OF PANCREATIC PSEUDOCYST PRESENTATION. *(E.)* Djadalizadeh, M.; Flemming II, A. B. C.; Lau, S. C. K.; Bonnabeau, Jr., R. C. (West Virginia Univ. Sch. Medicine, Morgantown, W. Va.). *W. Va. Med. J.* 71(6):133-134, 1975.

7840 EIGHT HUNDRED CHOLECYSTECTOMIES. A PLEA FOR MANY FEWER DRAINS. *(E.)* Ross, F. P.; Quinlan, R. M. (Burbank Hosp., Fitchburg, Mass.). *Arch. Surg.* 110(6):721-724, 1975.

7841 FLOW THROUGH THE BILE DUCT AFTER CHOLECYSTECTOMY. *(E.)* Scott, G. W.; Smallwood, R. E.; Rowlands, S. (Div. Surgery Biophysics, Univ. Calgary, Calgary, Alberta, Canada). *Surg. Gynecol. Obstet.* 140(6):912-918, 1975.

7842 TRENDS IN SURGICAL TREATMENT OF CALCULOUS DISEASE OF THE BILIARY TRACT. *(E.)* Glenn, F. (no affiliation given). *Surg. Gynecol. Obstet.* 140(6):877-884, 1975.

See also, 6993, 6994, 7000, 7011, 7021, 7027, 7033, 7061, 7067, 7068, 7100, 7114, 7169, 7267, 7305, 7306, 7307, 7336, 7341, 7523, 7530, 7554, 7568, 7589, 7619, 7643, 7688, 7724, 7946, 7961.

GENERAL

7843 CALCIUM-BINDING PROTEIN IN THE DUODENAL MUCOSA OF UREMIC PATIENTS AND NORMAL SUBJECTS. *(E.)* Piazolo, P.; Hotz, J.; Helmke, K.; Franz, H. E.; Schleyer, M. (Dept. für Innere Medizin, Universitat Ulm, Steinhövelstrasse 9, D 79 Ulm (Donau), Federal Republic Germany). *Kidney Int.* 8(2):110-118, 1975.

The content and localization of a specific calcium-binding protein in intestinal biopsy specimens were determined by immunological techiques in patients with terminal renal insufficiency and in normal controls. Of the 18 patients, nine had chronic glomerulonephritis in renal failure, one had rapidly progressive glomerulonephritis in renal failure, and eight were free of renal or gastrointestinal disorders. The control group of eight patients had functional gastrointestinal complaints. Highly purified calcium binding protein was obtained from normal human renal tissue, and a specific antiserum was prepared. Intestinal biopsies were ultrasonically homogenized, centrifuged, and the specific activity of the calcium binding protein was determined from the supernatant. An antiserum-agar gel mixture was made and incubated with antigen-containing material extracted from the biopsy specimens. To determine the site of the protein in the mucosa, frozen sections were made and overlaid with rabbit antisera and goat anti-rabbit gamma globulin conjugated with fluorescinisothiocyanate and were studied by fluorescence microscopy. In the eight healthy subjects, calcium-binding protein content was 10.80 μg/mg of protein in the supernatant from the biopsy material. In the uremic patients, there was a 67% reduction in content (3.65 μg/mg). In controls, specific immunological activity showed that the protein was distributed uniformly along the brush border and the basement membrane of the epithelial cells, and around and inside the goblet cells. In specimens from the uremic patients, the protein was localized nonhomogeneously in the brush border area, in the goblet cells and intensively along the basement membrane. In comparison to controls, fluorescence was reduced or absent in the brush border area. It is concluded that the calcium-binding protein was reduced in concentration in the intestinal mucosa of uremic patients, particularly along the brush border area.

7844 FOOD ANTIBODIES IN MALNUTRITION. *(E.)*

Chandra, R. K. (All India Inst. Medical Sciences, New Delhi, India). *Arch. Dis. Child.* 50(7): 532-534, 1975.

The presence of blood antibodies to food antigens and the titer and immunoglobulin (Ig) class of these antibodies were investigated in 20 malnourished children, aged six to 30 months. None of the children had gastroenteritis at the time of blood sampling. Tests were done on admission and after seven to 10 days of hospital stay during which period the children received a diet containing milk, wheat, rice, egg, meat, vegetables, legumes. Another set of 20 age-sex matched healthy children served as controls. Sera were tested against milk proteins, gluten, egg proteins, and sheep serum by microdouble immunodiffusion and the tanned sheep RBC hemagglutination method. Antibodies to several food proteins were detected in the serum of 13/20 malnourished children. Antibody activity was found mainly in the IgG and IgA class. On ingestion of food items to which antibodies were demonstrated, no untoward symptom occurred nor was complement activation observed *in vivo*. It is suggested that food antibodies in malnourished children result from atrophied gut mucosa and reduced secretory immune response, which permit passage of intact or incompletely digested protein molecules, and impaired phagocytic function of hepatic reticuloendothelial system. Such antibodies do not appear to play any immediate immunopathological role.

7845 THE SMALL BOWEL IN IMMUNOGLOBULIN DEFICIENCY SYNDROMES. *(E.)*

Marshak, R. H.; Hazzi, C.; Lindner, A. E.; Maklansky, D. (Mount Sinai Sch. Medicine, City Univ. New York, N.Y.). *Am. J. Gastroenterol.* 64(1):59-72, 1975.

A classification system and the description of roentgenographic features of various immunoglobulin (Ig) deficiency syndromes (due to a deficiency in B-cell number or function) with gastrointestinal manifestations are presented. Such deficiencies may be primary or secondary to a variety of diseases. Roentgenographic manifestations of the enteropathic Ig deficiency syndromes were organized in four groups. Sprue (malabsorption) pattern, as seen in hypogammaglobulinemia sprue and IgA-deficient sprue, was characterized by dilations of the small bowel, segmentation, fragmentation of the barium column, and hypersecretion. The second group included multiple nodular defects of variable Ig deficiencies in association with giardiasis (*Giardia lamblia* infection) of the stool, isolated IgA deficiency, and lymphosarcoma; characterized by a uniform distribution of innumerable tiny, smooth, nodular filling defects (1-3 mm in diameter) throughout the involved intestinal segment. Inflammatory changes secondary to giardiasis, the third category, were usually limited to the duodenum and jejunum and were associated with spasms, irritability, slight narrowing of the lumen with thickening and distortion of the folds. The presence of *Giardia lamblia* in the stool did not necessarily indicate an abnormal small bowel roentgenogram. The fourth classification, thickening of the small intestinal folds, was a feature of secondary Ig disorders as seen in amyloidosis, lymphosarcoma, plasma cell dyscrasias, intestinal lymphangiectasia, and possibly *alpha chain disease*. Recent advances in immunology have permitted the construction of a classification system for various Ig deficiency states associated with gastrointestinal manifestations, which is dependent upon their roentgenographic features.

7846 ABDOMINAL LYMPHOMA WITH α-HEAVY CHAIN DISEASE. *(Eng.)*

Plesnicar, S.; Sumi-Kriznik, T.; Golouh, R. (Inst. Oncology, Ljubljana, Yugoslavia). *Israel J. Med. Sci.* 11(8):832-837, 1975.

A 27-yr-old man was presented with abdominal lymphoma, malabsorption syndrome, 20-kg weight loss, and the presence of α-heavy chains in the serum; this was the first such case observed in Yugoslavia. Clinical, immunochemical and pathological studies were performed. X-ray examinations revealed changes of the gastrointestinal tract consistent with malabsorption syndrome; ^{131}I oleic acid test demonstrated impaired intestinal fat absorption; laparotomy disclosed enlarged lymph nodes adjacent to duodenum and in the mesentery, and gave an evaluation of chronic lymph-adenitis. Immunoelectrophoresis revealed α-heavy chains in the patient's serum, urine and intestinal fluid. Treatment with cyclophosphamide and corticosteroids produced an improvement in the patient's condition. He survived 18 mo after the onset of symptoms. Autopsy revealed a malignant lymphoma of mixed histiocytic-lymphocytic type involving the mesenteric lymph nodes primarily and also the jejunal mucosa, liver, spleen, and extraabdominal lymph nodes. It was assumed that the early stage of the disease was benign in character, but later became generalized with hepatosplenomegaly. This case is a further example of abdominal lymphoma complicated with α-heavy chains in serum reported from the Mediterranean area; etiologic factors (e.g., genetic tracts, food habits, intestinal infections, and climatic conditions) should be considered.

7847 MIGRATION OF PERIPHERAL LEUKOCYTES IN THE PRESENCE OF CARCINOEMBRYONIC ANTIGEN. STUDIES IN PATIENTS WITH CHRONIC INFLAMMATORY DISEASES OF THE INTESTINE AND CARCINOMA OF THE COLON AND PANCREAS.

(E.) Straus, E.; Vernace, S.; Janowitz, H.; Paronetto, F. (Mount Sinai Sch. Medicine, City Univ. New York, N.Y. 10229). *Proc. Soc. Exp. Biol. Med.* 148(2):494-497, 1975.

An *in vitro* correlate of cell-mediated immunity was used to study the response of purified carcinoembryonic antigen (CEA) in patients with conditions associated with the antigen. The patients included four with adenocarcinoma of the colon, four with carcinoma of the pancreas, four with active ulcerative colitis, 10 with Crohn's disease, and five normal subjects. The leukocyte migration test was performed using CEA prepared from a large hepatic metastasis of a colonic adenocarcinoma. Antigen prepared from normal adult colonic mucosa was also used. Radioimmunoassays for circulating CEA were carried out. The results of the leukocyte migration test using each antigen in protein concentrations of 50 and 250 μg/ml showed no significant inhibition by CEA in patients with Crohn's disease, ulcerative colitis or gastrointestinal malignancies. One exception was a patient with pancreatic carcinoma, with circulating CEA levels of over 20 ng/ml. Circulating CEA levels were above 2.5 ng/ml in 10 patients and below 2.5 ng/ml in two patients after resection for carcinoma of the colon. These results indicate that an organ-specific cellular reactivity cannot be attributed to CEA. It is further suggested that the histologic abnormalities in ulcerative colitis and Crohn's disease are not the result of delayed hypersensitivity to CEA.

7848 TRANSPLANTATION OF HUMAN CANCERS TO NUDE MICE AND EFFECTS OF THYMUS GRAFTS.

(E.) Schmidt, M.; Good, R. A. (Memorial Sloan-Kettering Cancer Center, 1275 York Ave., New York, N.Y. 10021). *J. Natl. Cancer Inst.* 55(1):81-87, 1975.

Efforts were made to transplant human malignant tissues of various origins, including the upper gastrointestinal tract, to male and female nude mice. The effects of thymus implantation to tumor-bearing animals was also studied. The human tumor cell lines used included: HUTU-80 isolated from an adenocarcinoma of the foregut; HS766 isolated from pancreatic adenocarcinoma; SK-Mel-5 isolated from melanoma; and WI-38 human embryonic lung fibroblasts. Surgical specimens of gastric adenocarcinomas, pancreatic adenocarcinomas, colon carcinomas, and malignant melanomas were also implanted in mice. Using HUTU-80, the tumors developed almost invariably within 1 week of inoculation, had exponential growth curves, and were able to reach half the size of their host within 60 days. HS766 produced a solid tumor nodule containing calcific foci at the site of injection. Linear growth rate, corresponding to the rate of its *in vitro* replication, was observed. SK-Mel-5 produced a tumor whose growth pattern was slow and linear, and one tumor produced melanin. Transplanted colon carcinoma grew at a rate similar to that of the HUTU-80 inoculates, whereas the development of the pancreatic implants was considerably slower, and that of the gastric adenocarcinoma and melanoma implants, externally inapparent. All tumors resembled the original neoplasm. Metastases were not observed. In one experiment, nine mice received thymus implants. Eight died spontaneously with decreased survival time. In nine other nude mice inoculated with HUTU-80, thymus implants caused tumor shrinkage, beginning after one month, and in four instances complete regression. These results represent the first known instance of successful transplantation of cell lines of human cancer of the foregut and pancreas to the nude mouse. The varying rates of growth of the tumors suggest that the rate of human xenograft development is controlled by endogenous cellular properties of the tumor rather than by a fundamental difference between the fate of inoculated tissue-cultured cell lines and that of surgical specimens. Models such as the nude mouse are particularly attractive because in them human tissues growing in a mammalian system can be used to develop chemotherapies and combination therapies directed toward human tumors themselves.

7849 ENTEROINVASIVE AND ENTEROTOXIGENIC *Escherichia coli*: OCCURRENCE IN ACUTE DIARRHEA OF INFANTS AND CHILDREN.

(E.) Rudoy, R. C.; Nelson, J. D. (Univ. Texas Southwestern Medical Sch., 5323 Harry Hines Blvd., Dallas, Tex. 75235). *Am. J. Dis. Child.* 129(6):668-672, 1975.

The abilities of *Escherichia coli* to induce diarrhea by enterotoxin production and by intestinal cell penetration were investigated simultaneously in children with diarrheal disease. Thirty-six infants and children with acute diarrhea and 17 healthy children (age range, less than one yr to more than five yr) were studied. From each patient's rectal swab culture, *E. coli* colonies were tested for enterotoxin production by intragastric inoculation in suckling mice and screened for cell penetration with HEp-2 cells. Colonies showing invasiveness in HEp-2 cells were further tested by inoculation into guinea pig conjunctivae. *Salmonella* or *Shigella* strains were isolated from 42% of the patients with diarrhea. Enterotoxin-producing strains of *E. coli* were found in 86% of the diarrhea group and in 41% of the healthy controls. Strains with capability to invade epithelial cells were found in 30% of the diarrhea group and in 12% of controls. In seven patients, *E. coli* strains demonstrated both enterotoxin production and invasiveness. Overall, bacteria capable of causing diarrhea (*Salmonella, Shigella,* and enteroinvasive or enterotoxigenic *E. coli*) were demonstrated in 94% of infants with diarrheal disease. However, the high frequency of enterotoxigenic strains in healthy controls suggests that in some patients with diarrhea there may be a coincidental carrier state with diarrhea actually due to another cause.

7850 INTESTINAL ABSORPTION, EXOCRINE PANCREATIC FUNCTION AND RESPONSE TO Vibrio cholerae INFECTION IN PROTEIN DEFICIENT PATAS MONKEYS (Erythrocebus patas).

(Eng.) Gyr, K.; Felsenfeld, O.; Wolf, R. H. (Tulane Univ. Delta Primate Res. Center, Covington, La. 70433). *Trans. R. Soc. Trop. Med. Hyg.* 69(2):247-250, 1975.

The effects of *Vibrio cholerae* infection on intestinal and exocrine pancreatic functions were studied in male and female patas monkeys maintained for 11 to 13 wk on a protein-free diet prior to challange (by gavage) with 0.9 to 1.2 x 10^6 *V. cholera* (Ogawa 41 strain). The serum proteins, albumin, globulin, and vibriocidal antibody titers were determined, the intestinal contents were collected through a double-lumen tube and analyzed for lipase, trypsin, and amylase, and the intestinal absorption of D-xylose and folic acid was estimated. After an average of 12.7 wk on the protein-free diet, the total serum protein dropped by 26.3%, albumin dropped by 34.2%, globulin dropped by 17.7%, and the average body weight loss was 17.4%. There was no significant change (compared with predieting values) in D-xylose absorption, but the absorption of folic acid decreased by 50.7%. Five of the six animals showed mean reductions in the intestinal trypsin, lipase, and amylase concentrations of 72.6%, 64.4%, and 94.8% resp.; the other animal showed minor reductions in all enzymes. The mean excretion time of the vibrios was 2.3 days in controls and 5.9 days in the animals on the protein-free diet. The monkey which showed little impairment in exocrine pancreatic function excreted vibrios for 2 days and did not develop diarrhea, whereas the other animals on the protein-free diet had diarrhea for an average of 1.7 days (one day in the controls). Serological test values did not vary between the experimental animals and controls except for the agglutination test, which yielded a higher titer 2 wk after challenge in the protein-depleted monkeys. The data suggest that circulating immunoglobulin production occupies a preferential status in protein synthesis.

7851 NECROTIZING ENTEROCOLITIS IN THE NEWBORN: OPERATIVE INDICATIONS.

(E.) O'Neill, J. A.; Stahlman, M. T.; Meng, H. C. (Vanderbilt Univ. Sch. Medicine, Nashville, Tenn. 37232). *Ann. Surg.* 182(3):274-279, 1975.

A plan for management of infants with neonatal necrotizing enterocolitis is described, and criteria for surgical intervention are analyzed. There were 52 infants, the majority of whom were of premature and low birth weight. The mothers of 47 had premature rupture of the membranes, severe meconium staining of the amniotic fluid, or prolonged and difficult labor. There were severe respiratory distress and hypoxia in 70% of the cases. Criteria for diagnosis of the disease included postmortem or postoperative information, or clinical observations on the basis of physical signs plus radiographic findings of pneumatosis intestinalis. Initial symptoms and signs included: sudden temperature instability (usually hypothermia), ileus with gastric retention, vomiting of bilious and/or guaiac positive material, abdominal distention, and lethargy. In 60% of the cases the first sign of the disease was seen within the first 5 days of life. Once diagnosis was suspected, p.o. or i.v. feeding was stopped and orogastric drainage was instituted. The superior vena cava was catheterized, and 10% glucose plus electrolytes was infused, gradually being increased to 20% glucose plus crystalline amino acids. Nasopharyngeal, stool, urine, endotracheal, cerebrospinal fluid and serial blood cultures were obtained, and i.v. antibiotics were administered. Examinations and recumbent and left lateral decubitus x-rays were done every 8 hr. Significant ascites was treated by paracentesis and the fluid was cultured. The decision to operate was individually based on clear cut signs of perforation or continued physiologic deterioration. A sudden drop in serum sodium and metabolic acidosis of longer than 4 hr duration were accurate indications of clinical deterioration. A sudden drop in platelet count or lengthening of partial thromboplastin time or prothrombin time always indicated bowel gangrene or perforation. Of 32 infants treated by supportive therapy only, 22 survived. Of the ten that died, two were not subjected to surgery due to irreversible central nervous system damage. Of 20 surgically-treated infants, 12 survived. Two of the eight non-survivors had involvement of the entire gastrointestinal tract; six others may have survived if operated on earlier in the course of the disease. No specific conclusions are drawn.

7852 RECESSIVE INHERITANCE OF THE ADULT TYPE OF INTESTINAL LACTASE DEFICIENCY.

(E.) Lisker, R.; Gonzales, B.; Daltabuit, M. (Instituto Nacional Nutricion, San Fernando y Viaducto Tlalpan, Mexico 22, D.F.). *Am. J. Hum. Genet.* 27(5):662-664, 1975.

The results of family studies performed in Mexico which corroborate that the inheritance of the adult type of lactase deficiency is controlled by a single recessive autosomal gene are presented. This corroboration is particularly important because the studies were performed in an ethnic group where lactase deficiency is frequent, which was not the case in the previous report. A total of 61 families with 177 children over six yr of age was investigated. All volunteered for the study and were not informed of its objective until completion of the tests so that milk drinking habits or intolerance symptoms would not influence the decision to cooperate in the investigation. To detect the presence of lactase deficiency, the lactose tolerance test was performed after an overnight fast. Each subject was given a dose of lactose equal to 2 g/kg body weight, except that those over 25 kg received a standard dose of 50 g. The criterion for lactase deficiency was a maximum blood glucose rise of less than 20 mg/100 ml. When the blood glucose rise was between 20 and 24 mg/100 ml (found in six subjects), the presence of explosive diarrhea within six hr of performing the test was taken as indicative of deficiency. Snyder's ratios were used to analyze the data. The results strongly suggest that this deficiency is inherited as a simple Mendelian recessive trait. The data presented, showing no significant differences between observed and expected phenotypes among the offspring, except for the deficient X deficient matings, support the hypothesis that the deficient state is controlled by an autosomal gene pair.

7853 CONSTRICTIVE PERICARDITIS AND PROTEIN LOSING ENTEROPATHY: AN IMITATOR OF INTESTINAL LYMPHANGIECTASIA. *(E.)*

Kumpe, D. A.; Jaffe, R. B.; Waldmann, T. A.; Weinstein, M. A. (Univ. Hosp., Baltimore, Md.). *Am. J. Roentgenol. Radium Ther. Nucl. Med.* 124(3):365-373, 1975.

The clinical and roentgenographic manifestations of constrictive pericarditis with secondary protein losing enteropathy are discussed and a typical case history is presented. A 14-year-old male suddenly developed abdominal cramps followed by frequent, explosive diarrhea. Examination revealed edema of the lower extremities and scrotum, a protuberant abdomen, Grade II/VI midsystolic murmur, hypocalcemia, a depressed mean lymphocyte count, anergy to multiple antigens, inability to reject a skin graft from an unrelated donor, and the characteristic cineangiocardiographic findings of constrictive pericarditis. A small bowel series showed the classic picture of intestinal lymphangiectasia which, along with the other signs and symptoms, had disappeared several months after removal of the pericardium from the anterior and lateral portions of the heart. In a series of four males and one female (2-32 yr of age) with the same disorder, edema was the major presenting complaint in all; only one patient manifested ascites. Anergy was present in one preoperatively and developed in a second patient 3.5 mo following pericardiectomy. The postulated mechanism in these cases was leakage of lymphocytes into the gastrointestinal lumen from the dilated lymphatics, producing lymphocytopenia and anergy. In four patients, the diagnosis of constrictive pericarditis was not suspected prior to extensive evaluation. In the four cases in which pericardiectomy was performed, there was a gradual return to clinical normality. The roentgenographic manifestations of the condition were essentially those of intestinal lymphangiectasia, and the gross and microscopic appearances of the small bowel were identical to those found in intestinal lymphangiectasia. The mechanism whereby protein losing enteropathy develops in constrictive pericarditis is not completely understood, but sustained systemic venous hypertension and relative thoracic duct obstruction appear to be involved. The time of recovery from the protein losing enteropathy following surgical correction of the constrictive pericarditis varies according to the pace of hemodynamic recovery. Constrictive pericarditis can be a subtle clinical entity and should be carefully excluded in all cases where gastrointestinal roentgenographic studies and intestinal biopsy indicate intestinal lymphangiectasia.

7854 ENTEROPATHY IN ADULT PROTEIN MALNUTRITION: A REVIEW OF THE CALI EXPERIENCE. *(E.)*

Mayoral, L. G.; Bolanos, O.; Lotero, H.; Duque, E. (Universidad del Valle Sch. Medicine, Apartado Aereo 1013, Cali, Colombia, South America). *Am. J. Clin. Nutr.* 28(8):894-900, 1975.

A review of the clinical findings in 41 patients with severe, primary, strictly defined protein malnutrition is presented. All cases had a history of low protein intake of at least 4 mo duration. Mean serum levels upon admission were: hemoglobin, 8.35 g/ml; total protein, 5.05 g/100 ml; albumin, 1.7 g/100 ml; cholesterol, 105 mg/100 ml; vitamin B_{12}, 500 p/ml; folate, 5.3 ng/ml. The D-xylose excretion test showed malabsorption in over half of the patients. Fat excretion tests showed a minimal degree of steatorrhea. Liver biopsies showed the presence of hepatic steatosis of variable severity. Radiologic abnormalities of the small intestine were: slow transit lines, thickening and disorganization of intestinal folds, segmentation and moulage. The deficiency pattern described in gluten-induced enteropathy was not seen. With protein repletion as the sole therapeutic modality, a progressive improvement in nutritional state, amelioration of clinical signs and disappearance of radiologic abnormalities was observed. These findings provide further evidence that malabsorptive damage does not always occur with severe primary protein malnutrition.

7855 GASTROINTESTINAL INVESTIGATIONS IN DERMATITIS HERPETIFORMIS. *(E.)*

Fausa, O.; Larsen, T. E.; Husby, G.; Thune, P. (Rikshospitalet, Oslo, Norway). *Acta Derm. Venereol. (Stockh.)* 55(3): 203-206, 1975.

The frequency and severity of gastric and intestinal abnormalities in dermatitis herpetiformis were studied in 37 patients (23 men and 14 women, aged 18-77 yr) with symptoms of six months to 40 yr duration. The following investigations were carried out: pentagastrin stimulation test (6 μg/kg, s.c.), secretin test, D-xylose absorption (25 g, p.o.), vitamin A absorption (350,000 IU), Schilling test for vitamin B_{12} absorption, folic acid determinations in serum and whole blood, vitamin B_{12} in blood, and jejunal and gastric biopsy. Vitamin A values were normal in 14 and low in 14 of 28 patients tested. Normal xylose absorption was seen in 12 and was low in 11 of 23. Vitamin B_{12} in blood was normal in all but five cases of 28 tested. Folic acid in serum was normal in 15 and low in 14 of 29; and in whole blood normal in all but five cases of 19 tested. Histologic features characteristic of gastritis were seen in 14 of 28 patients; 12 of these had hypo- or achlorhydria. Hypo- or achlorhydria was also seen in five of eight cases with nonatrophic gastritis. Granular deposits of immunoglobulin A were present in the dermoepidermal junction of uninvolved skin in 23 patients. Jejunal biopsy showed marked villous atrophy in 17 of 37 patients (46%); 12 of the 37 had more moderate changes and normal mucosa was seen in eight cases. These results confirm previous findings of gastric and small intestinal changes in dermatitis herpetiformis patients.

7856 MUCO-EPIDERMOID TUMORS OF THE SALIVARY GLANDS: 30 OBSERVATIONS. *(Fr.)* Brocheriou, Cl.; Seghir, M. (Hopital de la Salpetriere, 75013, Paris, France). *Rev. Stomatol. Chir. Maxillofac.* 75(8):1039-1047, 1974.

7857 PROCEEDINGS IN THE OPERATIVE TREATMENT OF GASTROINTESTINAL DISEASES. *(Ger.)* Schwemmle, K. (Surg. Clin., Univ. Erlangen-Nurnberg, Germany). *Fortschr. Med.* 93(5):226-230, 1975.

7858 BILATERAL TUMORS OF THE PAROTID GLANDS. *(It.)* Catania, V. C.; Bendieramonte, G.; Salvadori, B. (Istituto Nazionale per lo Studio e la Cura dei Tumori, Milano, Italy). *Tumori (Milano)* 61(9):39-44, 1975.

7859 DIAGNOSIS AND TREATMENT OF UPPER DIGESTIVE HEMORRHAGE. REPORT OF 103 CASES. *(Fr.)* Chevrel, J. P.; Gouffier, E.; Coste, T.; Cupa, M.; Le Goff, P. (Service de Chirurgie Generale et Digestive Hopital Franco-Musulman, Paris, France). *J. Chir (Paris)* 108(6):547-560, 1974.

7860 PATHOGENESIS AND FREQUENCY OF ESOPHAGEAL AND GASTRIC BLEEDING. *(Ger.)* Lechner, K.; Weisskirchner, R. (no affiliation given). *Thromb. Diath. Haemorrh.* (Suppl. 61):37-42, 1975.

7861 CARCINOIDS OF THE GASTROINTESTINAL TRACT. *(Ger.)* de Heer, K. (Surgery Clinic., Univ. Hamburg, Hamburg, Germany). *Med. Welt* 26(14):644-647, 1975.

7862 THE THERAPY OF CHRONIC OBSTIPATION: TREATMENT WITH GILLAZYMR®. *(Ger.)* Dittrich, W. (Heart Lung Sanitarium, LVA Hessen, Bad Schwalbach, Germany). *Therpiewoche* 25(12):1509-1512, 1975.

7863 GASTROINTESTINAL BLEEDING COMBINED WITH COAGULATION AND FIBRINOLYSIS DISTURBANCES. *(Ger.)* Von Kaulla, K.; Von Kaulla, E. (no affiliation given). *Thromb. Diath. Haemorrh.* (Suppl. 61): 171-182, 1975.

7864 PATHOLOGICAL AND ANATOMICAL VIEWPOINT OF GASTRIC AND DUODENAL BLEEDING. *(Ger.)* Otto, H. F. (no affiliation given). *Thromb. Diath. Haemorrh.* (Suppl. 61):131-144, 1975.

7865 ACUTE GASTRIC AND INTESTINAL BLEEDING. REPORT OF A ONE YEAR PROSPECTIVE ENDOSCOPIC CLINICAL STUDY. *(Ger.)* Kapp, F.; Baerlocher, C.; Fahrlander, H. (Dept. Medicine, Univ. Basel, Basel, Switzerland). *Thromb. Diath. Haemorrh.* (Suppl. 61): 145-154, 1975.

7866 THE EFFECT OF CALCIUM ADMINISTRATION ON GASTRIC ACID SECRETION IN PATIENTS WITH ZOLLINGER-ELLISON SYNDROME AND DUODENAL ULCER. *(Sp.)* Arenas Mirave, J. I.; Escartin Marin, P.; Chantar Barrios, C.; Garcia Plaza, A.; Fernandez Corugedo, A. (Puerta de Hierro Clinic, Madrid, Spain). *Rev. Esp. Enferm. Appar. Dig.* 45(4):367-372, 1975.

7867 RAPID DILATATION OF THE STOMACH, DUODENUM AND PART OF THE JEJUNUM. *(Fr.)* Francois, R. (no affiliation given). *Nouv. Presse Med.* 4(24): 1812-1813, 1975.

7868 CHECKS, BLOCKS AND COMPLICATION OF PARENTERAL HYPERALIMENTATION IN DIGESTIVE SURGERY. *(Fr.)* Launois, B.; Lemaire, M.; Campion, M. C.; Fontaine, P.; Pedech, A.; Campion, J. P.; Mai Van Dau, C. (Univ. Hosp. Center, Rennes, France). *Anesth. Analg. (Paris)* 31(6):941-952, 1974.

7869 A NEW ASSOCIATION OF ANTISPASMODICS AND ANTIBIOTICS IN THE THERAPY OF DIARRHEA. *(It.)* Canfora, V.; Lo Giudice, V. (S. Maria delle Grazie Hosp., Pozzuoli, Italy). *Clin. Ter.* 72(4): 353-364, 1975.

7870 SOME PATHOPHYSIOLOGICAL ASPECTS OF THE ILEOCECAL REGION OF THE INTESTINE. *(Cz.)* Fric, P. (Faculty General Medicine, Charles Univ., Prague, Czechoslovakia). *Cesk. Gastroenterol. Vyz.* 29(3):202-208, 1975.

7871 INTERNIST THERAPY FOR BLEEDING FROM ESOPHAGEAL AND GASTRIC VARICES: PRECAUTIONS, INDICATIONS, RESULTS, AND PROGNOSIS. *(Ger.)* Riegg, H.; Witte, S. (no affiliation given). *Thromb. Diath. Haemorrh.* (Suppl. 61):43-46, 1975.

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7936 TOTAL FAT EXCRETION IN MECONIUM AND FAECES OF NEWBORNS MEASURED BY A NEW METHOD OF HIGH CLINICAL USEFULNESS. *(Pol.)* Tomaszewski, L.; Hofman, H.; Koscielska, M. (Z. Zakladu Analityki Klinicznej Instytutu Biofarmecji AM w Warszawie, Poland). *Pediatr. Pol.* 50(5):545-556, 1975.

See also, 6990, 6995, 6996, 7023, 7026, 7034, 7042, 7052, 7100, 7112, 7212, 7222, 7326, 7327, 7369, 7557, 7583, 7703, 7938.

GENERAL

Parasitology

7937 CLINICAL TRIAL OF MEBENDAZOLE, A BROAD-SPECTRUM ANTHELMINTHIC. *(E.)* Hutchison, J. G. P.; Johnston, N. M.; Plevey, M. V. P.; Thangkhiew, I.; Aidney, C. (East Birmingham Hosp., Birmingham B9 5 ST, England). *Br. Med. J.* 2(5966):309-310, 1975.

Results are presented for a clinical trial of mebendazole in 85 children (aged 5-14 yr) with helminths. Mebendazole (200 mg/day for three days) was administered to all children with helminth ova detected by the formol-ether method. A second fecal specimen was obtained from seven to 21 days later, and any toxic effects determined. Of the 85 children, 65 (76%) appeared on the second examination to have been dewormed. In those with a single infestation, the cure rates were: ascaris, 100%; trichuris, 91%; hookworm, 94%; and hymenolyepis, 50%. All four children with ascaris and trichuris were cured, as were all three with ascaris, trichuris and hookworm. Of three with ascaris and hookworm, one was cured, and of the three with trichuris and hookworm, one was cured. Of seven children with hookworm and hymenolepis, only one was cured. Of 25 single infestations with *Giardia lamblia* cysts, 10 (40%) were cured. There was no evidence of drug toxicity. It is concluded that mebendazole is useful for treating multiple infestations in the United Kingdom.

7938 INCIDENCE OF INTESTINAL OBSTRUCTION IN CHILDREN INFECTED WITH Ascaris lumbricoides. *(Eng.)* Blumenthal, D. S.; Schultz, M. G. (U. S. Dept. Health, Education and Welfare, Atlanta, Ga. 30333). *Am. J. Trop. Med. Hyg.* 24(5):801-805, 1975.

The incidence of intestinal obstruction in children with *Ascaris lumbricoides* infection was estimated in the southeast United States, an ascariasis endemic area. Data were collected from ascariasis patients discharged from three rural southern Louisiana public hospitals from 1970 to 1973. Obstruction was defined as *Ascaris* infection plus three or more of the following clinical findings: vomiting, constipation for at least 24 hr, abdominal distention, a palpable abdominal mass, abnormal bowel sounds and radiographic findings. The prevalence of ascariasis in the three counties was calculated from 2,360 stool examinations performed by the State Health Dept. and by one hospital laboratory. Twenty-one patients (age range, 10 mo-14 yr) were hospitalized with complete or partial intestinal obstruction secondary to ascariasis during the 3-yr test period. Prevalence rates for younger and older children were similar, but the majority of intestinal obstruction was found in children, 1 to 5 yr of age (85%). There was no significant difference in rates of infection by sex. Prevalence rates were three times higher among blacks (19 of 21 cases). Thus, the incidence of intestinal obstruction was highest in children in the 1-5 yr age group, and approximated two obstructions/1000 infected children/6 yr.

7939 EOSINOPHILS AS MEDIATORS OF ANTIBODY-DEPENDENT DAMAGE TO SCHISTOSOMULA. *(E.)* Butterworth, A. E.; Sturrock, R. F.; Houba, V.; Mahmoud, A. A. F.; Sher, A.; Rees, P. H. (Wellcome Trust Res. Lab., PO Box 43640, Nairobi, Kenya). *Nature* 256(5520):727-729, 1975.

The release of ^{51}Cr from labeled *Schistosoma mansoni* larvae was used to measure damage to schistosomula by peripheral blood leukocytes from the heparinized blood of uninfected laboratory workers and from the heat-inactivated sera from five patients infected with *S. mansoni*. Isotope release was proportional to the logarithm of the effector to target ratio over a range of ratios from 50:1 to 5,000:1. Subsequent attempts to purify the effector cell showed that the cytotoxic activity was progressively lost during repeated cycles of incubation with carbonyl iron and subsequent magnetic extraction. Furthermore, after centrifugation of the starting effector cell preparation over Ficoll-Hypaque, the cells recovered from the pellet were ten-fold more active than those recovered from the interface. The pellet preparation contained 88% polymorphonuclear cells (PMN) and 12% mononuclear cells (MN), whereas the interface contained 9% PMN and 91% MN. Thus, it appeared that the active cell was a member of the PMN series. Unpurified effector cells were treated with antihuman eosinophil serum (AES) or antihuman neutrophil serum (ANS) and complement and were subsequently titrated for antibody-dependent cytotoxicity to schistosomula. Isotope release was related to the number of viable eosinophils, but not to the number of viable neutrophils. Cells from three patients with marked eosinophilia induced by schistosomiasis or other helminth infections did not show the increase in cytotoxic activity which would be predicted if all eosinophils were equally active, however. The data indicate that the major, and possibly the only, cell type in normal human peripheral blood capable of inducing antibody-dependent, complement-independent damage to schistosomula is the eosinophil.

7940 THE Schistosoma japonicum EGG GRANULOMA.

(E.) Warren, K. S.; Boros, D. L.; Hang, L. M.; Mahmoud, A. A. F. (Dept. Medicine, Case Western Reserve Univ., Cleveland, Ohio 44106). *Am. J. Pathol.* 80:279-294, 1975.

The early response to *Schistosoma japonicum* eggs in the livers of infected (*via* placement of ten cercariae on the shaved abdominal skin, female Swiss mice was studied, as was the reaction to 2000 eggs injected into the pulmonary arterioles of previously exposed (2-7 wk earlier) and unexposed mice. In other experiments, 2000 eggs were injected, i.v., into mice which had been sensitized 2 wk previously with i.p. or s.c. soluble egg antigens (SEA), s.c. SEA with complete Freund's adjuvant, s.c. eggs (3,000), or s.c. eggs with complete Freund's adjuvant. In animals with light *S. japonicum* infections, the livers contained 36,000 eggs 5 wk after infection (2 weeks after the beginning of egg production), but there was no histopathological reaction to the eggs nor any evidence of hepatosplenic disease. By 6 wk after infection, however, large abscesses replete with eosinophils were found around some of the eggs and there was noticeable periportal inflammation consisting predominantly of plasma cells. After 6 wk, major lesions were noted primarily around large aggregates of eggs, and hepatosplenomegaly and portal hypertension were observed. Living *S. japonicum* eggs injected into the pulmonary microvasculature of previously unexposed mice did not evoke significant granulomatous reactions on either primary or secondary exposure. Even when the eggs were injected into the lungs of infected animals, which had large granulomas around egg aggregates in the liver, little or no inflammatory reaction was seen around the eggs distributed singly throughout the pulmonary vessels. When a priming dose of eggs or SEA was injected, s.c., with or without Freund's adjuvant, however, significant granuloma formation occurred around eggs subsequently injected into the lungs. The data suggest that the immunologic factors responsible for granuloma formation around *S. mansoni* and *S. japonicum* eggs may differ significantly.

7941 ANTIEOSINOPHIL SERUM AND THE KINETICS OF EOSINOPHILIA IN Schistosomiasis mansoni.

(E.) Mahmoud, A. A. F.; Warren, K. S.; Graham, Jr., R. C. (Dept. Medicine, Case Western Reserve Univ., Cleveland, Ohio 44106). *J. Exp. Med.* 142(3):560-574, 1975.

Using a murine model of schistosomiasis, the most important helminth infection in man, the kinetics of eosinophilia in the peripheral blood, bone marrow, and tissue lesions were studied; this was followed by an examination of the effects of rabbit antimouse antieosinophil serum, developed in authors' laboratory, on these reactions. Groups of young adult female CF-1 mice were infected by s.c. injection of 10, 50, or 200 cercariae of the Puerto Rican strain of *Schistosoma mansoni* and the kinetics of peripheral blood and bone marrow eosinophilia were followed for as long as 20 weeks. When the schistosomula (immature worms) were migrating from the lungs to the liver there was a mild, transient eosinophilia, but soon after the onset of egg laying by the schistosomes, a major and prolonged increase in eosinophils occurred. This was terminated in the heavier infections by the death of the animals, but showed a spontaneous decline beginning at 18 week in the lightly infected mice. The effect of *S. mansoni* eggs on eosinophilia in the blood, bone marrow, and granulomatous lesions was then examined by injecting schistosome eggs into mice i.p., s.c., and i.v. While the host response was dependent on the route by which eggs were administered, primary peripheral and bone marrow responses were seen on i.v. injection, and secondary responses occurred on i.v. and s.c. injection. In unsensitized and egg-sensitized mice, eosinophils were first seen around eggs injected into the pulmonary microvasculature at 96 and 24 hr, resp. When the granulomas were maximal in size, eosinophils made up at least 50% of the lesions. Administration of rabbit antimouse antieosinophil serum profoundly suppressed eosinophils in the peripheral blood, eliminated mature eosinophils and markedly increased eosinophil precursors in the bone marrow, and ablated eosinophils from the tissue lesions, considerably reducing their area.

7942 COMPLICATING HYDATID CYSTS OF THE LIVER.

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GENERAL

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7965 HEPATIC AMOEBIASIS: ACTUAL DIAGNOSTIC AND THERAPEUTIC ASPECTS. *(It.)* Perpignano, G.; Argiolas, N.; Pintus, A. (Istituto di Speciale Batologia Medica, Univ. di Cagliari, Cagliari, Italy). *Rass. Med. Sarda* 26(2):143-168, 1974.

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7967 AMEBIC ABSCESS OF THE LIVER: RETROSPECTIVE STUDY OF 125 PATIENTS. *(Sp.)* Dehesa, M.; Cario, A.; Wolpert, E. (Departamento de Gastroenterologia, Instituto Nacional de la Nutricion, Mexico 22, D. F.). *Rev. Invest. Clin.* 27(2):129-133, 1975.

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7970 Trypanosoma rhodesiense: FOLATE LEVELS IN SERA AND TISSUES OF NORMAL AND FOLIC ACID-DEFICIENT RATS. *(E.)* Aboko-Cole, G. F.; Lee, C. M. (Dept. Zoology, Howard Univ., Washington, D.C. 20001). *Z. Parasitenkd.* 45(3):281-290, 1975.

7971 THE DEVELOPMENT OF THE PRIMITIVE EPITHELIUM AND TRUE TEGUMENT IN THE CERCARIA OF Schistosoma mansoni. *(E.)* Meuleman, E. A.; Holzmann, P. J. (Dept. Medical Microbiology and Parasitology, Free Univ., Amsterdam, Netherlands). *Z. Parasitenkd.* 45(4):307-318, 1975.

See also, 6984, 7006, 7059, 7383, 7513, 7920.

GENERAL

Regional Enteritis

7972 CROHN'S DISEASE IN A DEFINED POPULATION: AN EPIDEMIOLOGICAL STUDY OF INCIDENCE, PREVALENCE, MORTALITY, AND SECULAR TRENDS IN THE CITY OF MALMO, SWEDEN. *(E.)* Brahme, F.; Lindstrom, C.; Wenckert, A. (Malmo General Hosp., Malmo, Sweden). *Gastroenterology* 69(2):342-351, 1975.

A prospective epidemiological study of Crohn's disease in Malmo, Sweden, was carried out between 1958 and 1973. Case records were obtained from the single general hospital in the city; all cases met histological and/or radiological criteria for Crohn's disease. All cases of chronic ulcerative colitis were studied for comparative purposes. The mean annual incidence rate for new cases of Crohn's disease was $4.8/10^5$ inhibitants ($4.6/10^5$ for males and $5.1/10^5$ for females). The recorded incidence rates increased from $3.5/10^5$ during the first 8 yr to $6.0/10^5$ during the last 8 yr, the maximum annual incidence rate ($8.3/10^5$) being recorded in 1971. The ratio of small bowel to large bowel Crohn's disease remained at approximately 1.6 throughout the study period, the annual incidence rates of both types increasing during the last 8 yr. The mean annual incidence rate for ulcerative colitis was $6.4/10^5$ population. The median age at onset of Crohn's disease was 22 yr, and less than 6% of the patients were more than 50 yr at the time of onset. The age distribution for ulcerative colitis was similar to that of Crohn's disease. In 6 families, more than 1 first degree relative was afflicted with Crohn's disease, and the incidence rate among members of the Jewish population was 5-fold higher than in the non-Jewish population. The prevalence rates for Crohn's disease on December 21, 1965 and December 31, 1973 were 20.9 and 75.2 per 10^5 population, respectively; the prevalence rate for ulcerative colitis on December 31, 1968 was 89 per 10^5 population. During the 16-yr study period, 3.1% of the Crohn's disease patients died, the annual death rate from Crohn's disease being 0.15 per 10^5 population. The annual death rate from ulcerative colitis was 0.4 per 10^5 population. It is likely that an actual increase in the occurrence of Crohn's disease took place in Malmo during the time period studied.

7973 CROHN'S DISEASE AND PREGNANCY. *(E.)* Martimbeau, P. W.; Welch, J. S.; Weiland, L. H. (Mayo Clinic, 200 First St., SW, Rochester, Minnesota 55901). *Am. J. Obstet. Gynecol.* 122(6):746-749, 1975.

The relation between Crohn's disease and pregnancy was studied in two women clinically, and eight cases were reviewed in the literature, in which the disease commenced during pregnancy. A 34-yr-old woman presented during the sixth month of pregnancy with pain in the left upper quadrant and weight loss. There was a two-month history of moderate epigastric pain. She was found to have microcytic anemia. About a month later, a soft mass, 4 x 6 cm, was found between the epigastric area and left upper quadrant. It was tender, close to the anterior abdominal wall, and movable. She became febrile, signs of peritonitis appeared, and laparotomy was performed. The mass was a localized inflammatory process with adherence and involvement of the terminal ileum, cecum, ascending colon, and transverse colon. Right hemicolectomy with end-to-end ileotransverse colostomy was performed. Pathology confirmed advanced active regional enteritis. Spontaneous labor occurred 32 hr later, and an infant (Apgar score 7) was delivered and survived for 7 hr. The disease later recurred but remained quiescent. The second case involved a 34-yr-old woman who presented with diarrhea during the sixth month of pregnancy. The pregnancy was normal, but the diarrhea persisted after delivery. Roentgenograms showed Crohn's disease of the terminal ileum, which was brought under control with drugs and rest. Of the total of 10 cases in which Crohn's disease became symptomatic during pregnancy, six required surgery during or immediately after pregnancy. One died postoperatively. Of 11 fetuses, five lived (including a pair of twins). It is concluded that a generally favorable relation exists between Crohn's disease and pregnancy, but when active disease commences during pregnancy there is an increased risk to mother and fetus.

7974 A CASE OF 'CROHN'S CARCINOMA'. *(E.)* Fleming, K. A.; Pollock, A. C. (Glasgow Royal Infirmary, Scotland). *Gut* 16(7):533-537, 1975.

A case of adenocarcinoma of the ileum, occurring in an area concomitantly the site of Crohn's disease, is described. A 55-yr-old woman presented with a 4-week history of right-sided abdominal pain, nausea, vomiting, and weight loss. A tender mass in the right iliac fossa was provisionally diagnosed as an appendix mass; it slowly resolved during the subsequent 9 mo. A narrowed area in the terminal ileum remained unchanged, but the patient was free of symptoms. When the symptoms returned a yr later, a laparotomy was performed. The appearances were those of Crohn's disease of the terminal ileum in a quiescent phase and the affected portion of ileum and part of the cecum and ascending colon were removed, with end-to-end anastomosis of the ileum and colon. The patient recovered uneventfully and has remained well. Carcinoma was not suspected at operation or on macroscopic examination of the operative specimen. However, on microscopic examination, a moderately well-differentiated adenocarcinoma of the ileum arising in an area of Crohn's disease, with dysplastic surface epithelium was observed. Examination of the literature suggests that there are certain characteristics of the small bowel carcinoma which are found in Crohn's disease. These include invisibility of the tumor on macroscopic examination, dysplasia in the surrounding mucosa, and a peculiar endometriosis-like pattern of invasion. It is concluded that 'Crohn's carcinoma' is sufficiently different from carcinoma de novo to indicate that it is a definite complication of Crohn's disease of the small bowel. This possibility should be considered in any Crohn's disease patient who shows a sudden deterioration in condition.

7975 A SEARCH FOR A TRANSMISSIBLE AGENT IN CROHN'S DISEASE. *(E.)* Heatley, R. V.; Bolton, P. M.; Owen, E.; Williams, W. J.; Hughes, L. E. (Welsh Natl. Sch. Medicine, Cardiff, Wales). *Gut* 16(7):528-532, 1975.

To determine whether a transmissible agent might be responsible for Crohn's disease, homogenates of diseased human bowel from patients undergoing intestinal resection for Crohn's disease were repeatedly inoculated into the hind footpads or terminal ileums of Wistar rats, TO mice, and New Zealand white rabbits. In the rabbits, homogenates from one patient were injected into multiple sites in the terminal ileum and homogenates from another patient were injected into multiple sites in the appendix. Prior to inoculation of the homogenates, some rats underwent regional lymphadenectomy and ligation of the draining lymph trunk, and in some rats, the homogenate was instilled *via* nasogastric tube into the stomach. Except for the changes attributable to lymphedema and surgery, no macroscopic evidence of abnormality was seen in any of the animals. In addition, no sarcoid-like granulomas were found in any biopsy specimen of terminal ileum, colon, mesenteric lymph node, liver, or spleen. Of 56 ileums injected with Crohn's or control homogenates, only five showed evidence of mucosal inflammation; deposits of amyloid were also found in the villi of two mice injected with control homogenates. Of 19 injected rat footpads, six showed evidence of chronic inflammation. The results of all microbiological examinations were negative. The data indicate that it is unlikely that a transmissible agent is universally present in Crohn's disease and that it is therefore unlikely that such an agent has a significant role in the pathogenesis of this disease.

7976 VASCULAR PATTERN IN ILEAL CROHN'S DISEASE. *(E.)* Kalima, T. V.; Peltokallio, P.; Myllarniemi, H. (Univ. Central Hosp., Haartmaninkatu 4 00290 Helsinki 29, Finland). *Ann. Clin. Res.* 7(1):23-31, 1975.

Angio-, micro-, and histoangiographic studies were made of the vascular changes in Crohn's disease. Five patients with ileal Crohn's disease of at least three month's duration in the chronic phase were used. All cases were confirmed at laparotomy, and all had at least one ileal stricture. During surgery, one, two, or three mesenteric arteries were cannulated, and after resection contrast medium was injected into them. Continuous perfusion was maintained for four to six hr and x-rays were taken. For microangiography, specimens were fixed in formalin and cut into 3-5 mm slices. For histoangiography, specimens were sectioned at 5, 20, and 150 μ. The ileal vascular pattern was abnormal, but consistent in all patients. The long vasa recta branched normally from the marginal arcades, but the distances between them were much narrower than normal. Their number was increased three to five times per unit length of ileum and they were narrower by 30-50% in affected areas than unaffected areas. The angles between the anterior and posterior branches of the long vasa recta where the mesentery is thickened were wider than normal. The short vasa recta were also increased in number. The micro- and histoangiographic studies showed the submucosal vascular complex to be well-developed and more prominent than in the normal ileum. In the typical enlarged villi the small arteries were wider than normal, but the vascular architecture was essentially normal. It is concluded that selective mesenteric angiography may be useful in diagnosis of Crohn's disease, and in estimation of its extent.

7977 SEMIMACROSCOPIC EXAMINATION OF THE SURFACE PATTERN OF SMALL INTESTINAL MUCOSA IN CROHN'S DISEASE. *(E.)* Poulsen, S. S.; Nielsen, O. V.; Fabricius-Lauritzen, K. E. (Medicinsk-anatomisk institut B, Nφrre Allé 63, DK-2100 Copenhagen φ, Denmark). *Acta Pathol. Microbiol Scand [A]* 83(4):379-388, 1975.

A semimacroscopic examination was performed, using stained whole mounts, of the small intestine in Crohn's disease. Six patients, aged 16 to 30 years, were used. The main symptoms were pain, diarrhea and weight loss. In four of six patients, a palpable intra-abdominal mass, along with internal or *in ano* fistuals, was present. There were marked changes in villus appearance. These changes ranged from slightly enlarged, thick, short, club-shaped villi in the apical region to greatly enlarged, densely packed villi. The polypoid structures varied in size, were assembled in rows separated by narrow fissures and were avillous. Ulcerations were mostly flat-bottomed, sharply demarcated, irregular and usually confluent. Histological sections showed the villi with centrally located, dilated lymphatics in the early stages, followed progressively by edema and inflammation. All specimens showed changes described as being typical of Crohn's disease and satisfied the common histopathological criteria for this disease.

7978 SERUM LYMPHOCYTOTOXINS IN INFLAMMATORY BOWEL DISEASE. STUDIES OF FREQUENCY AND SPECIFICITY FOR LYMPHOCYTE SUBPOPULATIONS. *(E.)* Strickland, R. G.; Friedler, E. M.; Henderson, C. A.; Wilson, I. D.; Williams, Jr., R. C. (Univ. New Mexico Sch. Medicine, Albuquerque, N. M. 87131). *Clin. Exp. Immunol.* 21(3):384-393, 1975.

The relative T- or B-cell specificity of lymphocytotoxic antibodies occurring in the sera of patients with inflammatory bowel disease was examined. In addition, a preliminary attempt was made to examine the possible T-cell subpopulation specificities using T lymphocyte-enriched target cell preparations from patients with common variable immunodeficiency. Serum cold-reactive lymphocytotoxin (LCT) was detected in 23/56 (40%) patients with inflammatory bowel disease (IBD). The frequency of LCT detection was similar in Crohn's disease of either the small bowel or colon (43 of 56 patients studied) and ulcerative colitis (13/56 patients). Cytotoxicity testing against T or B cell-enriched peripheral blood lymphocytes from normal donors, together with absorption experiments, indicated that lymphocytotoxin in inflammatory bowel disease was reactive against determinants on both cell subpopulations. Reactivity against T cells from patients with common variable immunodeficiency was significantly less than with normal donor T cells. Lymphocytotoxin in inflammatory bowel disease could not be related to prior allogenic sensitization and its presence appeared to be unrelated to disease activity or drug therapy. No correlation was found between LCT and peripheral blood T- or B-cell numbers. The present findings suggest that the need for further investigation of the role of infectious agents in the pathogenesis of inflammatory bowel disease.

7979 THE IMMUNE RESPONSE TO φX 174 IN MAN. II. PRIMARY AND SECONDARY ANTIBODY PRODUCTION IN PATIENTS WITH CROHN'S DISEASE. *(E.)* Bucknall, R. C.; Jones, J. V.; Peacock, D. B. (Frenchay Hosp., Bristol, England). *Am. J. Dig. Dis.* 20(5):430-436, 1975.

A study was conducted of the ability of patients with Crohn's disease to develop a primary and secondary antibody response to a standard antigen. Ten patients in various stages of Crohn's disease were injected with 3.3×10^9 plaque-forming units of the bacteriophage φX 174. A further 5 patients with Crohn's disease were tested for the presence of preimmunization antibodies to φX 174. In 1 patient, antibody was present in the serum at a titer of 270 before immunization. None of the remaining patients had detectable preimmunization antibody. A normal primary response to the first injection of bacteriophage occurred in 9 patients. The one patient with detectable preimmunization antibody developed an IgG (secondary) response to the first injection of antigen. Apart from that one patient, primary responses are within the range of normal subjects for time of appearance of antibody, rate of increase of antibody titers, height and time of peak response, and rate of antibody decline. The same patient who showed antibody prior to injection showed no increase in antibody titer after the second injection of bacteriophage. The 9 remaining patients showed a secondary antibody response within the normal range in all parameters. The normal response to the bacteriophage in these 9 patients showed that the impaired cellular immunity found in Crohn's disease is not associated with depression of antibody production. It is suggested that the abnormal response in the one patient may be due to a defect in the local (IgA) immune mechanism in the gut, which would allow the bacteriophage to enter the circulation, or to the proliferation of bacteriophage in an abnormal environment. There was no correlation with gut surgery or with clinical activity. The results of this study allow the conclusion that there is no evidence of impaired capacity for antibody production in Crohn's disease.

7980 REOPERATION AND RECURRENCE IN CROHN'S COLITIS AND ILEOCOLITIS: CRUDE AND CUMULATIVE RATES. *(Eng.)* Greenstein, A. J.; Sachar, D. B.; Pasternack, B. S.; Janowitz, H. D. (Mount Sinai Sch. Medicine, City Univ. New York, New York, N.Y. 10029). *N. Engl. J. Med.* 293(14):685-690, 1975.

Follow-up data from crude and actuarial (life-table) methods of 160 patients (mean age, 24 yr) hospitalized with Crohn's colitis (30 patients) or ileocolitis (130) from 1964-1973 were analyzed to determine the risk of recurrence. Of a total of 100 patients who underwent major operation (65% with ileocolitis and 50% with Crohn's disease), 58 (63%) required reoperation. There was a cumulative reoperation rate of 89 by the 15th yr after the initial operation and an overall clinical recurrence of 94%. Crude data indicate that the reoperation rate diminished with each succeeding operative procedure; 58% to 47% from the first to the fourth operation. By contrast, actuarial analysis revealed that at the 3-yr follow-up point, the cumulative chance of reoperation increased from 37% to 60% for the first to the fourth operation. The crude reoperation rate was higher after bypass than after resection, indicating residual disease after bypass procedures. It is concluded that the evaluation of clinical or operative procedures by crude recurrence rates is misleading, as it fails to account for differing length of follow-up study. The authors also suggest a re-evaluation of the literature and more rigid definition of the disease and of a true recurrence.

7981 A CONTROLLED TRIAL OF AZATHIOPRINE IN CROHN'S DISEASE. *(E.)* Rosenberg, J. L.; Levin, B.; Wall, A. J.; Kirsner, J. B. (Dept. Med., Univ. Chicago, 950 East 59 St., Chicago, Ill. 60637). *Am. J. Dig. Dis.* 20(8):721-726, 1975.

The present trial was undertaken to determine if the steroid-sparing properties may be attributed to azathioprine in the treatment of Crohn's disease and to assess the effects of this agent on the clinical course of patients with Crohn's disease who appear to require steroids for the control of symptoms. A group of 20 patients (nine female and 11 male, age range 15-56 yr) with Crohn's disease of the small intestine or small intestine and colon, requiring at least 10 mg prednisone/day over the three months prior to entering the study, were randomized into placebo (10 patients) and azathioprine (10 patients; 2.0 mg/kg/day) treatment groups, and followed thereafter for 26 weeks. Of every 10 patients entering the study, half were in each group. Prior to and on completion of the study each patient had a complete blood count, platelet count, serum iron and iron-binding capacity, serum protein electrophoresis, liver function tests, and complete x-rays of the gastrointestinal tract. Patients were interviewed in clinic or by telephone at least every two weeks of the trial and questioned specifically about diarrhea, pain, malaise, weight loss, and fever. Reduction of steroids was the major criterion of success in the trial. There were seven relapses in the placebo group (five patients) and two relapses in the azathioprine group (2 patients). Complications including fistulae were not affected by the medications. The mean reduction in steroid dosage in the azathioprine group at the end of the trial (-15.5 mg) was greater than in the placebo group (-6.1 mg). These results suggest that azathioprine may permit reduction or discontinuation of steroids without worsening of symptoms in some patients who appear to require steroids for control of their symptoms. The clinical features of this "azathioprine-responsive subgroup" remain to be defined.

7982 THE EFFECT OF THE SITE OF LESION AND EXTENT OF RESECTION IN DUODENAL BILE ACID CONCENTRATION AND VITAMIN B_{12} ABSORPTION IN CROHN'S DISEASE. *(E.)* Lenz, K. (Rigshospitalet, Blegdamsvej 9, 2100, Copenhagen, Denmark). *Scand. J. Gastroenterol.* 10(3): 241-248, 1975.

Duodenal bile acid concentrations following a standard meal, the glycine/taurine (G/T) ratio, vitamin B_{12} absorption, and fecal fat were determined in 70 patients with Crohn's disease. Jejunal resection had been performed in four patients and ileal resection in 46; of these 50 patients, five also had a cecal resection, 23 a hemicolectomy, and nine a subtotal or total colectomy. Two had an ileorectal anastomosis and 11 an ileostomy. Active disease was present only in 10 of the 29 unoperated patients. Almost all of 29 patients subjected to ileal resection of 50 cm or more had a reduced bile acid concentration and vitamin B_{12} malabsorption. The degree of vitamin B_{12} malabsorption showed a better correlation ($P < 0.001$) with the length of ileal resection than did the duodenal bile acid concentration ($P < 0.05$). Patients with small ileal resections (10-50 cm) and unoperated patients did not show a consistent pattern; however, 10 of 17 with limited resection had decreased bile acid concentrations and seven had vitamin B_{12} malabsorption. A comparison in 68 patients (operated and unoperated) showed that postprandial duodenal bile acid concentration and vitamin B_{12} absorption are equally efficient as indicators of ileal dysfunction; both were decreased in about half the cases. This pattern was not seen in ileostomy patients in whom duodenal bile acid concentration decreased in every case, while vitamin B_{12} malabsorption occurred only in those with large ileal resections (80 cm or more). The G/T ratio was elevated only in patients with large resections and the elevation was not related to the presence of abnormal duodenal flora. Fecal fat was much more elevated in ileostomy patients with large ileal resections than in unoperated patients and those without an ileostomy. In addition to demonstrating a close correlation between vitamin B_{12} malabsorption and the extent of ileal resection, this study supports the importance of colonic bile acid absorption in patients with ileal dysfunction.

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GASTROENTEROLOGY

ABSTRACTS
AND
CITATIONS

ATIONAL INSTITUTE OF ARTHRITIS, METABOLISM, AND DIGESTIVE DISEASES

S. DEPARTMENT OF
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DECEMBER 1975
VOLUME 9, NO. 12
8003—9414

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Volume 9 No. 12 Abstract and Citation Nos. 8003-9414

GASTROENTEROLOGY ABSTRACTS AND CITATIONS

A monthly publication of the
National Institute of Arthritis, Metabolism, and Digestive Diseases

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Bruce H. Kleinstein, Ph.D., Technical Editor
for the
National Institute of Arthritis, Metabolism, and Digestive Diseases
pursuant to Contract Number NO1-AM-4-2204

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GASTROENTEROLOGY ABSTRACTS and CITATIONS is a publication of the National Institute of Arthritis, Metabolism and Digestive Diseases. This specialized information medium has been initiated to fill an existing great need in the field of gastroenterology and to assist the Institute in meeting its obligations to foster and support laboratory and clinical research into the nature, causes, and therapy of diseases of the gastrointestinal tract. Publication GASTROENTEROLOGY ABSTRACTS and CITATIONS makes available citations of all current papers relevant to this field from medical journals published throughout the world. Approximately one-third of the citations dealing with the major aspects of gastroenterology have accompanying abstracts.

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The Secretary of the Department of Health, Education, and Welfare has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through April 30, 1975.

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LANGUAGE ABBREVIATIONS

Afr.	Afrikaans	It.	Italian
Ar.	Arabic	Jap.	Japanese
Bul.	Bulgarian	Kor.	Korean
Ch.	Chinese	Latv.	Latvian
Cz.	Czech	Lith.	Lithuanian
Dan.	Danish	Nor.	Norwegian
Dut.	Dutch	Pol.	Polish
E.	English	Por.	Portuguese
Eston.	Estonian	Rum.	Rumanian
Fin.	Finnish	Rus.	Russian
Fl.	Flemish	Ser.	Serbo-Croatian
Fr.	French	Sl.	Slovak
Ger.	German	Sp.	Spanish
Gr.	Greek	Sw.	Swedish
Heb.	Hebrew	Th.	Thai
Hun.	Hungarian	Turk.	Turkish
Ic.	Icelandic	Uk.	Ukrainian
In.	Indonesian	Viet.	Vietnamese

ABBREVIATIONS USED IN ABSTRACTS

ACTH	adrenocorticotropic hormone
ADP	adenosine diphosphate
AMP	adenosine monophosphate
amp	ampere
ATP	adenosine triphosphate
Å	angstrom
BSP	sulfobromophthalein
C	degrees centigrade
cal	calories
cc	cubic centimeter
cm	centimeter(s)
dl	deciliter
DNA	deoxyribonucleic acid
ED_{50}	median effective dose(s)
EDTA	ethylenediamine tetraacetic acid
e.g.	for example
EEG	electroencephalogram
ESR	erythrocyte sedimentation rate
g	gram(s)
μg	microgram(s)
Hz	Herz
hr	hour(s)
i.m.	intramuscular
i.p.	intraperitoneal
IU	international unit(s)
i.v.	intravenous
kcal	kilocalorie(s)
kg	kilogram(s)
K_m	Michaelis constant
LD_{50}	median lethal dose(s)
LDH	lactic acid dehydrogenase
m	meter(s)
M	molar; mole(s)
mM	millimolar; millimole(s)
μM	micromolar; micromole(s)
ma	milliampere(s)
mCi, μCi	milli-, microcurie(s)
mEq	milliequivalent(s)
mg	milligram(s)
ml, μl	milli-, microliter(s)

mm	millimeter(s)
mOsm	milliosmolar; milliosmeter(s)
msec	millisecond(s)
mV	millivolt(s)
min	minute(s)
MTD	maximum tolerated dose
NAD	nicotanamide adenine dinucleotide
NADH	reduced nicotanamide adenine dinucleotide
NADP	nicotanamide adenine dinucleotidephosphate
NADPH	reduced nicotanamide adenine dinucleotidephosphate
ng	nanogram (10^{-9})
nm	nanometer(s)
Pa	ambient pressure
PAS	periodic acid — Schiff
pg	picogram (10^{-12})
pgEq	picogram equivalent(s)
p.o.	orally
ppb	parts per billion
ppm	parts per million
r	Roentgen
RBC	red blood cells (erythrocytes), red blood count
resp.	respectively
RNA	ribonucleic acid
s.c.	subcutaneous
sec	second(s)
SGOT	serum glutamic-oxalacetic transaminase
SGPT	serum glutamic-pyruvic transaminase
U	unit(s)
UV	ultraviolet
V	volt
WBC	white blood cells (leukocytes), white blood count
yr	year(s)

PRE-CLINICAL SCIENCES

MORPHOLOGY, CELLULAR STRUCTURE AND HISTOCHEMISTRY

8003 STUDIES OF INTESTINAL LYMPHOID TISSUE. I. ELECTRON MICROSCOPIC EVIDENCE OF 'BLAST FORMATION' IN EPITHELIAL LYMPHOCYTES OF MOUSE SMALL INTESTINAL MUCOSA. *(E.)* Marsh, M. N. (Southampton Univ. Sch. Med., England). *Gut* 16(9):665-674, 1975.

The morphology of epithelial lymphocytes was studied by light and electron microscopy in osmium-fixed, Epon-embedded jejunum from adult male Charles River mice. Thick (1 nm) plastic sections, stained with toluidine blue, were compared with adjacent thin sections, permitting precise ultrastructural identification and description of selected epithelial lymphocytes. The epithelial lymphocytes varied considerably in size and shape, the majority measuring about 5-9 μm in diameter. In addition, about 5% of the lymphocytes were greater than 10 μm in diameter and were considered to be immunoblasts, while the remaining 5% were typical small lymphocytes (less than 5.5 μm in diameter) with round, heterochromatic nuclei and scanty cytoplasm. The medium-sized lymphocytes were characterized by multiple, deep-staining lysosomes, extensive Golgi apparatus, prominent centrioles, and abundant ribosomes. Mitochondria were larger and more abundant in medium-sized than in small lymphocytes; most cells contained scattered rough endoplasmic reticulum. The nuclei of the medium-sized cells were circular or fusiform, with prominent, often multiple, nucleoli, variable amounts of heterochromatin, and more euchromatin than the small lymphocytes. Immunoblasts contained large, euchromatic nuclei, and their cytoplasm was generally lightly or only moderately stained. Immunoblasts were packed with clusters of ribosomes with very little rough endoplasmic reticulum. The mitochondria were normal or markedly enlarged and the nuclei contained very large nucleoli with only scanty heterochromatin. The data indicate that lymphocyte transformation occurs within the interepithelial cell spaces of the small intestinal mucosa and suggest that epithelial lymphocytes are immunocompetent cells which may be responsive to local antigenic stimulation.

8004 SCANNING ELECTRON MICROSCOPY OF THE RAT LIVER. STUDIES OF THE EFFECT OF TAUROLITHOCHOLATE AND OTHER MODELS OF CHOLESTASIS. *(E.)* Layden, T. J.; Schwarz, J.; Boyer, J. L. (Dept. Medicine, Univ. Chicago, Chicago, Ill.). *Gastroenterology* 69(3):724-738, 1975.

Scanning electron microscopy was used to evaluate the normal surface anatomy of rat (male and female Sprague-Dawley strain) sinusoids, hepatocytes, and canalicular lumen, and to assess changes in the surface morphology of the bile canaliculus following bile duct ligation, ethynyl estradiol administration (0.5 mg/day for 5 days, i.p.), or the administration of sodium taurolithocholate, sodium taurocholate, and/or lithocholate sulfate (0.6-0.8 μM/0.16 ml/min). Sodium taurolithocholate-induced cholestasis was associated with specific dilation and disruption of the canalicular membranes; these changes corresponded to the evaginations of the pericanalicular ectoplasm observed by transmission electron microscopy. Lithocholate sulfate and sodium taurocholate prevented the occurrence of these severe abnormalities. Bile duct ligation produced progressive canalicular dilation (from 1 to 96 hr) and loss of microvilli, but did not result in the type of membrane changes produced by sodium taurolithocholate. No significant changes in canalicular morphology were observed following ethynyl estradiol treatment. The data demonstrate the value of scanning electron microscopy in the evaluation of both normal and abnormal hepatic surface morphology. They also indicate that sodium taurolithocholate produces a distinctive abnormality in the structure of the canalicular membrane, probably as the result of a direct toxic effect on the membrane structure; this abnormality is not seen in other models of cholestasis.

8005 SCANNING ELECTRON MICROSCOPY OF PROLIFERATING BILE DUCTULES. *(E.)* Brooks, S. E. H.; Reynolds, P.; Audretsch, J. J.; Haggis, G. (Dept. Pathology, Univ. West Indies, Kingston 7, Jamaica). *Lab. Invest.* 33(3):311-315, 1975.

Bile duct ligation was performed on 75 male Sprague-Dawley rats in order to induce bile ductular proliferation. The animals were sacrificed one day to six weeks later and the effects of the ligation were examined by scanning electron microscopy (SEM). After perfusion fixation with glutaraldehyde and ethanol dehydration, blocks of liver were frozen in liquid nitrogen, fractured, and returned to ethanol prior to critical point drying. Ligation of the common bile duct provoked a rapid proliferation of intrahepatic bile ductules, which was obvious by day three, and was accompanied by focal necrosis, acute inflammation, and mitotic activity, predominantly in hepatocytes but also evident in ductal cells. Reticulin developed around the bile ductules. The proliferating bile ductules and preductules were surrounded by collagen and arranged longitudinally. The luminal surfaces of the ductules contained many microvilli. Canalicular distention was also visible three days after ligation and was accompanied by blunting of the microvilli. Freezing the tissue in 100% ethanol prevented the formation of ice-crystal artifact. Thus, the canalicular distension seen was a result of ligation and not a preparative artifact. Uniform "cables" (190 nm in width) were observed in the lumen. Transmission electron microscopy indicated that the cables had the structure of cilia. Occasionally, spheroid structures, which may have represented bile components precipitated by fixation, were seen in the lumen of the ductules. Sinusoids were not prominent in the areas of the liver that were crowded with proliferating ducts. It is concluded that this SEM technique has created a new approach to the study of liver morphology. These approaches may be useful in the study of human cholestasis and obstructive jaundice.

MORPHOLOGY, CELLULAR STRUCTURE AND HISTOCHEMISTRY

8006 A MORPHOMETRIC STUDY OF NORMAL HUMAN LIVER CELL NUCLEI. *(E.)* Ranek, L.; Keiding, N.; Jensen, S. T. (Medical Dept. A, Rigshospitalet, Copenhagen, Denmark). *Acta Pathol. Microbiol. Scand.* [*A*] 83(5):467-476, 1975.

The nuclear size, variation in size, and prevalence of polyploid and binuclear liver cells were estimated in liver needle biopsies from 12 patients with normal livers. Liver cell nuclear size was estimated in the fasting biopsy samples by the projection method. The distributions of the lengths of the nuclear radii were consistent with normal distributions corresponding to the different ploidy classes. Diploid nuclei constituted 84 to 99% of the liver cell nuclei; the frequency of polyploid nuclei increased with increasing age. Samples of nuclei within the same biopsy revealed significant differences in the mean radius of the diploid nuclei and in the frequency of polyploid nuclei. One of the two patients with acromegaly had a higher frequency of polyploid nuclei than was seen in the other subjects, and in both patients with acromegaly the size of the diploid nuclei was larger than in the other subjects. The frequency of binuclear nuclei was unrelated to age and frequency of polyploid nuclei, but males were found to have more binuclear liver cells than females. The projection method was found to be precise and reproducible with no significant optical distortion. The nuclear volume was found to increase with increasing length of fixation, however. The data support the concept that the nuclei of different ploidy classes form nuclear classes and that the nuclear radii form normal distributions. The data also indicate that the biological variation in nuclear size and frequency of polyploid nuclei within the same biopsy should be taken into account when karyometric data are interpreted.

8007 ENERGY DISPERSIVE X-RAY MICROANALYSIS OF ZYMOGEN GRANULES OF MOUSE PANCREAS USING FRESH AIR DRIED TISSUE SPREAD. *(E.)* Takaya, K. (Hiroshima Univ. Sch. Med., Japan). *Arch Histol. Jpn.* 37(5):387-393, 1975.

The intracellular distribution of elements in pancreatic zymogen granules was studied in fresh air-dried mouse pancreas spreads using an energy dispersive X-ray microanalyzer attached to an electron microscope. In very thin areas of the tissue spread, zymogen granules could be clearly recognized as homogenously electron-dense round bodies about 300 nm in diameter. The limiting membranes of the granules usually could not be seen. Mitochondria appeared as rounded or elongated structures containing abundant electron-dense structures 300-600 Å and 100-200 Å in diameter; the rough endoplasmic reticulum was often seen. The nucleus was more electron-dense than the surrounding cytoplasm and contained electron-dense heterochromatin at its periphery. The zymogen granules were often surrounded by a streak of transparency attributable to shrinkage by dehydration. Electron probe microanalysis by the energy dispersive spectrometer disclosed peaks for sulfur, chlorine, potassium, and phosphorus in 3 of 5 granules examined; sulfur, chlorine, and potassium in 1 granule; and only sulfur and chlorine in the remaining granule. Analysis of 5 spots about 200 nm away from the respective zymogen granules showed no peaks for any element with the exception of one spot in which phosphorus and chlorine were detected. In contrast to the general belief that enzymes and electrolytes are excreted into the juice separately, these results suggest that the electrolyte content of the secretory granules may contribute to the pancreatic juice.

8008 ULTRASTRUCTURES OF NORMAL RECTAL MUCOSA. *(Fr.)* Marche, C.; Bocquet, L. (Service Central d' Anatomie pathologique, Hopital Bichat, 170 Bd Ney, 75877 Paris Cedex 18, France). *Ann Gastroenterol. Hepatol.* 10(4):301-314, 1974.

An examination of normal rectal mucosa was made which revealed crypts of Lieberkuhn separated by tissue composed of argyrophilic fibers and a polymorphic cellular population (fibroblasts, fibrocytes, histiocytes, plasmocytes, eosinophils, a few polynucleated neutrophils, mastocytes). In the normal rectal cells, differentiation and maturation followed a regular cellular progression leading from the bottom of the Lieberkuhn crypts up to the mucosal surface. The bottom of the crypts was found to be a zone of cellular multiplication (young and undifferentiated cells) and was also the origin of enterochromaffin cells. The only mature cells detected were endocrine cells with four different morphological characteristics, implying possibly more than one type of hormonal secretion. The median part of the crypts was essentially a differentiation-migration zone composed of "intermediary" cells, muco-secreting cells (immature calciform cells), and immature absorbing cells. Finally, the major functional zone (the top part of the crypts and the surface epithelium) contained mature calciform cells and mature absorbing cells, the junctional systems of which were complex. Ultrastructures of the normal rectum are similar to those of the small intestine and may have the same function: i.e., local adaptation, which is produced by slowing of the cellular turnover and a simplification of the absorption apparatus.

8009 NONRANDOM DISTRIBUTION OF GOBLET CELLS AROUND THE CIRCUMFERENCE OF COLONIC CRYPT. *(E.)* Goralski, A.; Sawicki, W.; Blaton, O. (Sch. Medicine, Chalubinskiego 5, 02-004 Warsaw, Poland). *Cell Tissue Res.* 160(4):551-556, 1975.

To investigate the distribution of goblet cells (GC) around colonic crypts, adult male guinea pigs were maintained on a standard laboratory diet and water for three days before being killed. The highest frequency of GC was found at the bottoms of the crypts. Maps of transverse sections of crypts were prepared from consecutive sections of the colon by means of a microscopic eye piece projector. Mature GC were identified by a slightly deformed nucleus. Transverse crypt sections (2826) from 116 crypts were analyzed. The observed mean variance of angular distance between GC was compared to the expected mean. The comparison was verified by Student's test although the distribution of D_m^2 (variance of angular distance) differed from the normal distribution. The GC appeared around the crypt circumference in pairs, triplets and quadruplets, and were distributed in a significantly nonrandom manner. A superimposition of the distributions suggested a three dimensional arrangement. Factors controlling the distribution were concluded to be endogenous since changing the environment of the intestinal wall (by transplantation) did not apparently alter the GC density in the crypts.

8010 FINE STRUCTURE OF HEPATOCYTES FROM FASTED AND FED RATS. *(E.)* Babcock, M. B.; Cardell, R. R., Jr. (Sch. Medicine, Univ. Virginia, Charlottesville, Va. 22901). *Am. J. Anat.* 143(4): 399-438, 1975.

Hepatocytes from Sprague-Dawley rats on a controlled cycle of feeding and fasting were studied by transmission electron microscopy and by light microscopy. Quantitative chemical determinations of glycogen were made on each specimen. The animals were fasted for 30 hr before the final feeding period, and liver samples were removed from each group (6 rats) at the following specific intervals after initiation of the two-hr feeding period: 0 hr (30 hr fasted), one hr, two hr, and at two-hr intervals up to 24 hr. Hepatocytes from 30-hr fasted rats with extremely low hepatic glycogen levels were devoid of glycogen particles. Centrilobular cells showed areas of the cytoplasm rich in vesicles of smooth endoplasmic reticulum (SER) while periportal hepatocytes contained less extensive SER regions. Glycogen particles appeared next to the SER soon after the onset of feeding. Glycogen was dispersed throughout SER regions in centrilobular hepatocytes while it was dense next to SER membranes in periportal cells. Twelve hours after feeding, maximum glycogen levels were obtained as well as the lowest SER quantity. This inverse correlation occurred both during glycogen deposition and depletion; hence, SER is implicated in both glycogen deposition and degradation in rat hepatocytes.

8011 COLCHICINE-INDUCED LESIONS IN THE RAT DUODENUM. *(E.)* Dinsdale, D. (Rowett Research Inst., Greenburn Road, Bucksburn, Aberdeen AB2 9SB, Scotland). *Pathol. Eur.* 10(2):95-104, 1975.

The effects of s.c. colchicine (0.1-4.0 mg/kg) and s.c. cytosine arabinoside HCl (125-500 mg/kg) on the intestinal crypts of male Hooded Lister rats (Rowett Institute strain) were studied by light and electron microscopy. Rats were sacrificed three to six hr after drug administration, and the first 20 mm of duodenum excised. No treated rats showed signs of distress, although rats treated with 4 mg/kg colchicine became lethargic at 4-5 hr. On light microscopy, mucosal crypt lesions, absent from mature villi and consisting of rounded slightly eosinophilic bodies often surrounded by halos, appeared at 0.4 mg/kg colchicine and were maximal at 2.0 mg/kg; cytosine arabinoside HCl induced qualitatively and quantitatively similar lesions at 500 mg/kg. These lesions usually enclosed small basophilic inclusions, which were Feulgen-positive (but only slightly less after treatment with deoxyribonuclease I). Animals pretreated with cycloheximide (1 mg/kg s.c.) and injected 30 min later with two mg/kg colchicine had lesions similar to those treated with 0.4 mg/kg. On electron microscopy, these bodies ranged from 0.5-8.0 μm in diameter and were usually isolated from surrounding cytoplasm by a double membrane. The contents ranged from apparently normal mitochondria and endoplasmic reticulum to amorphous patches of cellular material. These lesions were never found to contain Golgi bodies and they did not invariably contain nuclei or nuclear remnants. It is suggested that this damage by colchicine is similar to that reported for other drugs and possibly results from the effect of colchicine inhibition of microtubular formation. The protection offered by cycloheximide is probably due to interference with the cellular response to injury through inhibition of enzyme and protein synthesis.

8012 DEGENERATION OF ADRENERGIC AXONS IN THE LONGITUDINAL MUSCLE COAT OF THE RAT DUODENUM FOLLOWING TREATMENT WITH 6-HYDROXYDOPAMINE. *(E.)* Wong, W. C. (Dept. Anatomy, Univ. Singapore, Sepoy Lines, Singapore 3). *Experientia* 31(9):1080-1082, 1975.

The degeneration of adrenergic axons in the longitudinal muscle coat of adult albino rat duodenum after a single i.v. injection of 6-hydroxydopamine (100 mg/kg of 6-OHDA through the saphenous vein) was described. Rats were sacrificed one hr after injection. Electron microscopy of the longitudinal muscle coat of untreated rats revealed that the coat was 30-35 μm thick, thinner than circular coat (4/5 of the latter's thickness). The 6-OHDA-treated rats showed small- to medium-sized nerve bundles in the core of the longitudinal coat with axons sometimes seen to approach individual muscle fibers. Adrenergic axons within nerve bundles with small granulated vesicles, agranular vesicles and large granular vesicles were observed. Signs of early degeneration (general darkening, swollen vesicles and degenerating mitochondria) were seen in some of the axons. The pattern of innervation of the longitudinal coat of the rat duodenum resembled the multi-axonal neuromuscular relation described in the smooth muscle of the anuran gut; most of the junctions had wide gaps, 150 mm or more. The ratio of thickness between longitudinal and circular muscle coats in the rat duodenum and guinea pig ileum were different: 4:5 and 1:2, resp. Thus, 6-OHDA may be used in combination with electron microscopy to demonstrate the presence and distribution of adrenergic axons in the muscularis externa of the mammalian gut. In addition, regional differences in the adrenergic innervation of the smooth muscle of the mammalian gut were confirmed.

8013 EFFECTS OF PROLONGED ADMINISTRATION OF TRITON WR-1339 TO THE RAT ON MORPHOLOGY AND PHOSPHOLIPIDS OF LIVER. *(E.)* Huterer, S.; Phillips, M. J.; Wherrett, J. R. (Toronto General Hosp., Toronto, Canada). *Lab. Invest.* 33(3):305-310, 1975.

The effects of continuing administration of Triton WR-1339 on phospholipid composition and morphology in male Wistar rat liver were investigated. Fifteen rats received a series of ten injections of Triton WR-1339 (170 mg, i.p.) over a period of four weeks. Twelve of the animals were killed in groups of three on days 4, 10, 18, and 28 following the last injection. The remaining three animals were allowed to recover for two weeks before being sacrificed. Three additional rats were used as controls, received no injections, and were killed on day 28. Light and electron microscopy and analysis of liver lipids and acid phosphatase were performed on all animals. Treatment with Triton WR-1339 caused the appearance in both hepatocytes and Kupffer cells of secondary lysosomes, which increased in number and size during the course of treatment. The change in hepatocytes disappeared almost completely by two weeks after cessation of treatment whereas this change became accentuated in the Kupffer cells. A 75% increase in the concentration of lipids taken into the liver was noted, along with a 17% decrease in the concentration of total phospholipid and a 26% increase in acid phosphatase. Small decreases were observed in phosphatidylethanolamine (302-241 μg/g fresh weight), phosphatidylcholine (662-500 μg/g), and diphosphatidylglycerol (77-52 μg/g). A small increase was noted in sphingomyelin (71-83 μg/g) and a large increase in bis(monoacylglyceryl)-phosphate (2.5 to 55 μg/g). Cerebrosides were also increased. In the rats that were given two weeks to recover, those classes whose values had been decreased by the treatment showed a trend to return to control values; however, classes whose values were increased diverged further from control values. The results suggest that bis(monoacylglyceryl)phosphate is localized to lysosomes and, in addition, that lysosomal material is transferred from hepatocytes to Kupffer cells.

8014 ANASTOMOTIC VESSELS DIGESTIVE ARTERIES. A TOPOGRAPHIC STUDY. *(Fr.)* Bennet, J. M.; Bigot, J. M.; Monnier, J. P. (Hopital St. Antoine, Service de Radiologie, 27, rue Chaligny, F 75012 Paris, France). *Ann. Radiol.* 17(5):507-518, 1974.

Using arteriograms processed over a 4-yr period, common and infrequent anastomoses were investigated to help in the treatment of thrombosis and digestive trunk stenosis, and to aid in the efficiency of surgical procedures. The anastomosing networks which were always present were the pancreaticoduodenal arches joining the celiac trunk to the superior mesenteric artery *via* the gastroduodenal artery. Another consistent feature was an anastomosis stemming from the right gastroepiploic artery, reuniting the superior mesenteric artery to the celiac trunk. Riolan's arch, which anastomoses the superior mesenteric artery to the inferior mesenteric, was also seen consistently. Rectal anastomoses were quite common, and united the inferior mesenteric artery to the branches of the hypogastic artery. Uncommon anastomoses appeared irregularly and were often associated with pathological conditions. Anastomoses *via* Tandler's arch, Kurk's arch and the dorsal pancreatic artery may join the celiac trunk and the superior mesenteric artery. The hepatic artery anastomosed with the left gastric artery and bridges between hepatic branches were also seen. The hepatic and the splenic arteries may anastomose with the pyloric-left gastic anastomosis, and with the left and right gastroepiploic arteries. The importance of these anastomoses in the development of collateral circulation at the time of aortic thrombosis is stressed.

8015 THE HISTOLOGICAL STATE OF THE GASTRIC AND DUODENAL MUCOSA IN HEALTHY VOLUNTEERS [abstract]. *(E.)* Roca, M.; Truelove, S. C.; Whitehead, R. (Radcliffe Infirm., Oxford, England). *Gut* 16(5):404, 1975.

8016 COMPARATIVE SURFACE MICROANATOMY OF HEPATOCYTES AND SINUSOIDAL ENDOTHELIAL CELLS IN MOUSE, RAT, AND RABBIT [abstract]. *(E.)* Nopanitaya, W.; Grisham, J. W. (Sch. Med., Univ. North Carolina, Chapel Hill). *Gastroenterology* 68(4):1060, 1975.

8017 EFFECT OF DIOCTYL SODIUM SULFOSUCCINATE (DSS) ON STRUCTURE AND FUNCTION OF HUMAN AND RAT INTESTINE [abstract]. *(E.)* Saunders, D. R.; Sillery, J.; Rachmilewitz, D. (Dep. Med., Univ. Washington, Seattle, Wash.). *Gastroenterology* 68(4):980, 1975.

8018 ULTRASTRUCTURAL LOCALIZATION OF IgA AND SECRETORY COMPONENT (SC) IN HUMAN INTESTINAL MUCOSA BY IMMUNOPEROXIDASE TECHNIQUES [abstract]. *(E.)* Brown, W. R.; Isobe, Y.; Nakane, P. K. (VA Hosp., Denver, Colo.). *Gastroenterology* 68(4):869, 1975.

See also, 8150, 8156, 8205, 8207, 9040, 9149, 9387.

8019 SURFACTANTS AND BIOELECTRIC PROPERTIES OF RAT JEJUNUM. *(E.)* Feldman, D. S.; Rabinovitch, S.; Feldman, E. B. (State Univ. New York Downstate Med. Cent., Brooklyn). *Am. J. Dig. Dis.* 20(9):866-870, 1975.

The effects of nonionic (polyoxyethylene sorbitan oleate or Tween 80), anionic (sodium *n*-dodecylsulfate), and cationic (cetyltrimethylammonium bromide or cetrimide) surfactants on transmural potentials, short-circuit currents, and tissue resistance were studied *in vitro* in segments of rat jejunum. The mucosal and serosal compartments were perfused separately: with glucose and no surfactant (control), and with glucose and 10 mM surfactant. The resistance of the bathing solution was unaffected by the addition of surfactants. However, with Tween 80, the transmural potential difference increased by 1/3, the short-circuit doubled, and the resistance decreased by 30%. With sodium dodecylsulfate, the transmural potential difference increased by 20%, the short-circuit current increased by 66%, and the resistance decreased by 19%. In contrast, cetrimide decreased the transmural potential by 23%, decreased the short-circuit current by 34%, and increased the resistance by 22%. The bioelectric effects were reversible when test solutions were replaced with buffer. When electrical activity was measured in tissues exposed to surfactants in sodium sulfate buffer with no chloride ions, the bioelectric effects of the surfactants were negligible or were opposite to the effects obtained in the presence of chloride ions. Three analogs of sodium dodecylsulfate (6-ethyl-3-decylsulfate, sodium dodecane 1,12-disulfate, and cyclic sodium dodecylsulfate) had no significant effect on the bioelectric properties of tissues bathed in buffer containing chloride ions. Tween 80 produced no changes in bioelectric properties when introduced into the serosal chamber.

8020 A COMPARISON OF STABLE AND ^{3}H-LABELLED POLYETHYLENE GLYCOL 4000 AS NON-ABSORBABLE WATER PHASE MARKERS IN THE HUMAN ILEUM AND FAECES. *(E.)* Krag, E.; Krag, B.; Lenz, K. (Gentofte Univ. Hosp., DK-2900 Copenhagen/Hellerup, Denmark). *Scand. J. Gastroenterol.* 10(1):105-108, 1975.

[^{3}H]-labeled polyethylene glycol and stable polyethylene glycol 4000 were compared as nonabsorbable water phase markers in five patients with nonoperated regional ileitis (Crohn's disease). A four-lumen polyvinyl tube with a proximal occlusive balloon and a distal mercury bag was passed nasally into the fasted subjects until the mercury bag was in the cecum or within 10 cm of the ileocecal valve. The subjects were then perfused for 90 min each with four consecutive solutions. Some of the solutions contained 0.25 to 2.50 nM/l of glycochenodeoxycholic acid, and all of them contained polyethylene glycol 4000 (5 g/l) and [^{3}H]-polyethylene glycol 4000 (5 μCi/l). The feces and urine were collected for two days thereafter, and the stable and [^{3}H]-labeled polyethylene glycol concentrations were determined; the concentrations in the ileal infusates and aspirates were also determined. Turbidimetric assay and liquid scintillation counting yielded similar estimates of water absorption and secretion. Tracer amounts of ^{3}H were found in the urine, indicating minimal absorption. The data demonstrate the value of using [^{3}H]-labeled polyethylene glycol 4000 as a volume marker. The ^{3}H radioassay is simple and reproducible, the dose applied and the radiation energy are low, and the absorption is very low, so that the amount of exposure to ionizing radiation is negligible.

8021 ABSORPTION OF L-HISTIDINE AND GLUCOSE FROM THE JEJUNUM SEGMENT OF THE PIG AND ITS DIURNAL FLUCTUATION. *(E.)* Furuya, S.; Takahashi, S. (Dept. Nutrition, Natl. Inst. of Animal Industry, Chiba-Shi 280, Japan). *Br. J. Nutr.* 34(2):267-277, 1975.

Quantitative aspects of L-histidine and glucose absorption from the jejunum segment of female pigs (3 pigs, 10-15 weeks old) fitted with three simple cannulas were described. In addition, the diurnal fluctuations in L-histidine and glucose absorption with time after feeding were investigated. The pigs were given 40 g food/kg body weight once daily (at 8.30 hr) and weighed weekly. The maximum flow (958 g/hr) of digesta (collected 3 times/day) was obtained in the period 10.00 to 10.30 hr. The flow rate decreased with time after feeding, reaching a minimum (286 g/hr) in the period 22.00 to 22.30. Test solution concentrations ranged from 2.5 to 20 g/l for each material. The absorption rate for L-histidine and glucose increased in a hyperbolic manner with increasing concentrations of infused test material. L-histidine and glucose were absorbed nearly independently when perfused in combination. The absorption rates for glucose were significantly greater than the corresponding rates for L-histidine at each concentration of infusate. The absorption of both L-histidine and glucose (expressed as a percentage of the amounts in the perfusate) decreased as the flow rate of the perfusate increased from 400 to 800 ml/hr. The increase in flow rate from 400 to 800 ml/hr was associated with a 20% increase in L-histidine absorption rate; there was a 30% increase in glucose absorption rate when the flow rate was increased to 600 ml/hr, but no further increases at 800 ml/hr. The absorption of both L-histidine and glucose decreased with time after feeding; the absorption rates for L-histidine and glucose for the period 10.00-10.30 hr were 126 and 133%, resp., of those for the period 22.00-22.30 hr. It was concluded that the intestinal absorptive capacity is not the limiting factor in carbohydrate assimilation from the small intestine of the pig.

8022 THE ROLES OF BILE SALTS IN THE UPTAKE OF β-CAROTENE AND RETINOL BY RAT EVERTED GUT SACS. *(E.)* El-Gorab, M. I.; Underwood, B. A.; Loerch, J. D. (Div. Biological Health, Pennsylvania State Univ., Univ. Park, Pa. 16802). *Biochim. Biophys. Acta* 401 (2):265-277, 1975.

The possible roles of bile salts in the uptake of β-carotene and retinol under conditions simulating those present in the intestinal lumen during lipid absorption were investigated. Adult male Wistar rats were fasted overnight and their small intestines were removed. These everted guts were used to compare uptakes of $[^3H]$β-carotene and $[^3H]$retinol from micellar solutions and from emulsions of both bile salts and nonphysiological detergents (Tween 20 and hexadecyltrimethlammonium bromide). Varying bile salt concentrations (2-16 mM) enhanced the uptake significantly in micellar solutions and less significantly in emulsions. Maximum uptake occurred at the critical micellar concentration of the bile salt mixture (8-10mM). At higher concentrations, the β-carotene uptake level decreased and retinol absorption remained high. The physical state of the incubation medium as well as the detergent type affected the magnitude of the uptake. Regardless of the physical state, uptake in micellar solution was greater (1.2 to 3.5 times) than that in an emulsion mixture and uptake decreased in the following order: bile salts>Tween 20>hexadecyltrimethylammonium bromide. In β-carotene absorption, bile salts may have been required for interaction with the cell membrane or as a transport carrier. β-carotene cleavage and conversion to retinyl esters occurred only in bile salt solutions; retinol esterification was seen in all detergents. These effects increased with the tri-/dihydroxy bile salt ratio. β-carotene uptake was reversible, first order and passive at low concentrations, and 10% of the substrate was taken up after 60 min. Retinol uptake was much more rapid (50% taken up in 60 min), and was partially inhibited by 2, 4-dinitrophenol at higher concentrations. An energy requiring step is probably the rate-limiting factor.

8023 LIPID ABSORPTION IN BILE FISTULA RATS: LACK OF A REQUIREMENT FOR BILIARY LECITHIN. *(E.)*

Rodgers, J. B. (Albany Medical Coll., Albany, N.Y. 12208). *Biochim. Biophys. Acta* 398(1):92-100, 1975.

Adult male Sprague-Dawley rats were used to test the effect of biliary or dietary phosphatidylcholine (lecithin) on the lipid absorption process. Experimental animals had a cannulation of the common bile duct to exclude bile from the intestine and a cannulation of the duodenum for infusion of diet and artificial bile; controls had only the latter. The diet was a basic amino acid liquid diet comprising 19 amino acids (including methionine), dextrin, sucrose, salt mixture RH and vitamin fortification mix (omitting choline chloride). The diet was infused for 48 hr through the duodenal cannula at a rate of 2.4 ml/hr. The amounts of total phospholipid, lecithin and phosphatidylethanolamine in microsomal preparations were quantified. Protein determinations as well as assays of acyl-CoA synthetase were performed. *In vivo* lipid absorption was studied using infusate labeled with $[^{14}C]$ triolein. Acyl-CoA synthetase and monoglyceride acyltransferase levels decreased significantly. The composition of the microsomal membrane showed that the phosphatidylethanolamine content was less and the lecithin content was greater for controls than experimental rats. The *in vivo* group showed that recovery of labeled material was similar for the controls and for both bile fistula groups, suggesting that biliary and dietary lecithin were not essential for normal lipid absorption. In all groups, 70% of the recovered radioactive lipid was in the form of triglycerol, suggesting an excess of lipid re-esterifying enzymes in the bowel: less of the label was recovered from the ileal mucosa. Significant amounts of lecithin were recovered from the intestinal lumen of bile fistula rats which had not received the material in the duodenal perfusate. These results indicate that neither biliary or dietary lecithin is absolutely essential for the intracellular events that occur during fat absorption and transport.

8024 ABSORPTION OF INTACT PROTEIN BY COLONIC EPITHELIAL CELLS OF THE RAT. *(E.)*

Worthington, B. S.; Enwonwu, C. (Dept. of Nutrition and Oral Biology, Univ. Washington, Seattle, Wash. 98195). *Am. J. Dig. Dis.* 20(8):750-763, 1975.

Colonic absorption of intact protein was examined over a four-wk period in ten adult male Sprague-Dawley (SD) rats using histological and ultrastructural procedures. The absorption was evaluated using ligated intestinal loop procedures; after flushing the lumen several times with saline solution, Sigma type VI horseradish peroxidase (5 mg/ml) was introduced into the ligated segment of the colon, and each loop was retained *in vivo* for 5, 10, 20, or 30 min. Two groups of controls were used, one which received peroxidase and another which did not. Light and electron microscopic evaluation of each control sample revealed a smooth surface with long crypts. Loops not exposed to intraluminal peroxidase demonstrated endogenous enzyme activity in red and white blood cells and around goblet cells in the epithelium. Neither exposure to horseradish peroxidase nor incubation in diaminobenzidine and/or hydrogen peroxide media produced noticeable alterations in histochemical, histological or ultrastructural characteristics of the control tissue. Histological examination of the experimental groups revealed evidence of peroxidase absorption by surface absorptive cells; the degree of mucosal penetration did not appear to relate to the degree of integrity of the colonic tissue. The mechanism involved a pinocytotic process followed by vesicular transport and exocytosis at lateral and basal cell membrances. It is known that in SD rats, endogenous peroxidase production by surface and crypt cells is minimal. It is possible that the observed transport phenomenon might contribute to the establishment of pathological changes in the colonic mucosa or to the manifestations of systemic disorders associated with circulating toxic and/or antigenic compounds.

8025 INHIBITION OF INTESTINAL ABSORPTION OF PHENYLALANINE BY PHENYLALANINOL. *(E.)*

Shimomura, K.; Fukushima, T.; Danno, T.; Matsumoto, K.; Miyoshi, M.; Kowa, Y. (Safety Res. Lab., Tanabe Seiyaku Co. Ltd., Yodogawa-ku, Osaka 532, Japan). *J. Biochem.* 78(2):269-275, 1975.

The inhibitory effect of phenylalaninol on the intestinal absorption of phenylalanine in the phenylalanine load test and in the everted sac method was studied. In load tests, male Wistar rats received p.o. phenylalaninol dissolved in 300 mg/10 ml of

L-phenylalanine or pure water; 30, 60, or 90 min later plasma phenylalanine and tyrosine levels were determined by fluorometric methods. Ten ml/kg of L-phenylalanine solution without L-phenylalaninol was administered p.o. as a control. In everted sac experiments, the small intestine, from a point 34 cm under the pylorus, was quickly removed, rinsed, everted, and tied into sacs five to six cm (450-600 mg) in length; three sacs were prepared from each rat. L-phenylalanine or L-tyrosine in Krebs-Henseleit bicarbonate buffer, pH 7.4, containing 20 mM glucose was placed within the sacs (0.5 ml) at the same concentration as the solution outside the sacs (5.0 ml). Incubation time was one hr and the temperature was 37 C. In some experiments, phenylalaninol was added at a 5:1 or 10:1 ratio with respect to the other amino acids. Phenylalanine and tyrosine were assayed as in the other experiment. Sodium and potassium excretions in urine were determined in male Wistar rats that were divided into six groups, as follows: (1) L-phenylalanine (800 mg/kg); (2) L-phenylalanine (800 mg/kg) plus phenylalaninol (200 mg/kg); (3) L-phenylalanine (800 mg/kg) plus cycloleucine (200 mg/kg); (4) phenylalaninol (200 mg/kg); (5) cycloleucine (200 mg/kg); and (6) pure water. Individual rats were placed in a metabolic cage and urine was collected for six hr after p.o. administration of these compounds. Sodium and potassium were assayed by the flame photometric method. Since the amino acid levels in rats administered L-phenylalanine solution containing L-phenylalaninol were significantly lower than those in rats administered L-phenylalanine alone, L-phenylalaninol appears to inhibit the intestinal absorption of L-phenylalanine. This effect was more potent than that of cycloleucine. L-phenylalaninol inhibited the phenylalanine transport of everted sacs. The K_m value of L-phenylalanine was 3.44 x 10^{-3} M and the K_i value of L-phenylalaninol was 7.69 x 10^{-3} M from Lineweaver-Burk plots. From these two curves, it appears that L-phenylalaninol may competitively inhibit the intestinal transport of L-phenylalanine. Studies on the effects of L-phenylalanine, L-phenylalaninol and cycloleucine on the urinary excretions of Na^+ and K^+ in rats have revealed that potassium excretion (which increased on p.o. administration of L-phenylalanine) is suppressed by the administration of L-phenylalaninol but not by administration of cycloleucine. L-phenylalaninol alone enhanced Na^+ excretion in urine. These results confirm that L-phenylalaninol shows inhibitory effects as potent as those of cycloleucine on the intestinal absorption of L-phenylalanine.

8026 TRANSPORT STUDIES IN THE SMALL BOWEL OBSTRUCTION OF THE RAT.

(E.) Merkle, P.; Breitig, D.; Bindewald, H. (Klinische Grundlagenforschung der Universitat Ulm, Ulm, West Germany). *Digestion* 12(2):111-113, 1975.

The authors simultaneously studied active and passive transport (diffusion) *in vivo* to clarify which factors may be responsible for the reduced transport capacity in obstruction. The small intestine was mechanically obstructed in male SPF rats anesthetized with ether 25 cm below the ligament of Treitz. After 24 and 48 hr, the obstructed bowel was emptied over a length of 20 cm and the content was measured. It was replaced by an identical amount (approximately 2 ml) of Ringer's solution containing 1 µCi ^{14}C-glucose and 2 µCi ^3H-antipyrine. After 15 min this solution was removed, and the bowel was rinsed by additional two ml of Ringer's solution. The size of the different groups varied from 9 to 13 animals. The remaining radioactivity was determined using a liquid scintillation counter (Packard). The absorption rates corresponded to the total given activity minus the measured rest-activity. Control rats were sham-operated (laparotomy), and a bowel piece of the same length was filled with two ml of the above described labeled solution, which was also removed after 15 min. The absorption of ^3H-antipyrine after 24 hr was significantly reduced in the obstructed bowel compared to controls and it was only slightly further reduced after 48 hr. The absorption of ^{14}C-glucose after 24 hr was similarly reduced but was distinctly further decreased after 48 hr. The energy-dependent absorption of glucose was altered in occlusion and decreased corresponding to the duration of obstruction. These findings agree with the *in vitro* studies of Kubrova et al. (1973). The authors conclude that up to 24 hr after occlusion, disturbance of mucosal permeability is the main cause for the reduced absorption capacity and that this disturbance most probably is a consequence of bowel edema, which can be seen histologically in this phase. They state that the further decrease of absorption capacity 48 hr after occlusion concerns mostly the active transport and must be caused metabolically; obviously a tissue hypoxia must be present at this stage. This hypothesis is supported by the fact that in other studies no alteration of capillary circulation could be observed in obstruction.

8027 PLASMA DISAPPEARANCE OF SULFOBROMOPHTHALEIN OR INDOCYANINE GREEN IN UNCONJUGATED HYPERBILIRUBINEMIA.

(E.) Yeary, R. A.; Wise, K. J. (Dept. of Veterinary Physiology and Pharmacology, Ohio State Univ., Columbus, Ohio, 43210). *Res. Commun. Chem. Pathol. Pharmacol.* 12(1):125-136, 1975.

The effect of unconjugated hyperbilirubinemia on hepatic dye transport in adult Gunn rats was compared to the dissappearance rates of both indocyanine (ICG) and BSP. Lightly anesthesized rats of either genotype (icteric homozygous or nonicteric heterozygous) were injected with BSP at doses of 40, 60, 100 or 150 mg/kg followed by ICG at 4, 8, or 64 mg/kg; samples were drawn after 1, 5, 10, 20, 30, 45 and 60 min. Bilirubin, BSP and ICG have been found to be bound to ligandin (a cytoplasmic protein identified as glutathionine S transferase B) in the hepatocyte. Bilirubin did not compete for the ligandin binding sites of BSP or ICG in the intact rat. Neither ICG nor BSP had any effect on the plasma disappearance of bilirubin. In contrast, rifamycin nonselectively decreased bilirubin content of the supernatant fraction, ligandin and Z protein in rat liver homogenates and produced an increase in plasma bilirubin. A plasma membrane uptake unrelated to intracellular transport was observed following simultaneous injection of bilirubin and ICG and it did not affect the plasma disappearance of bilirubin-pretreated rats. Rifamycin had a similar effect on hepatic uptake of ICG. The high binding affinity of bilirubin for plasma proteins overran the small quantities of unbound bilirubin in cellular uptake competition of ICG unless the two substances were injected simultaneously. Phenobarbital pretreatment increased the rate of plasma disappearance of BSP when 80 mg/kg were injected i.p. in icteric rats. This report seems very much in agreement with other experiments on the same issues.

8028 AMINO ACID MOVEMENTS ACROSS THE WALL OF ANURAN SMALL INTESTINE PERFUSED THROUGH THE VASCULAR BED. *(E.)* Boyd, C. A. R.; Cheeseman, C. I.; Parsons, D. S. (Dept. Biochemistry, South Parks Rd., Oxford, OX1 3QU, England). *J. Physiol.* 250(2):409-429, 1975.

L-leucine transfer across the wall of the small intestine was studied in a vascularly perfused preparation from four species of frog (*Rana pipiens, R. catesbeiana, R. temporaria* and *R. ridibunda*). Some modifications of the original procedure were made: e.g., the cannulation of the portal vein permitting continuous sampling of the tissue vascular effluent was achieved by leaving the intestine *in situ* in the animal. L-leucine was estimated by the L-amino oxidase-peroxidase technique. In the steady state of absorption, the transfer function relating the net flux of exogenous L-leucine into the vascular bed to the concentration in the lumen exhibited saturation. The apparent concentration in the lumen for half-maximum transfer of L-leucine was 2.1 mM. Removal of the Na ions from the lumen inhibited the transfer of L-leucine into the vascular bed. Additional removal of Na ions from the fluid in the vascular bed was further inhibitory to the transfer of the amino acid. L-leucine that was previously absorbed from the lumen appeared in the vascular bed in a biphasic fashion. In addition, the size of the L-leucine pool within the tissue that drains into the vascular bed was estimated. It was concluded that failure to achieve consistent and high portal effluent flow was largely due to mechanical factors; careful and accurate positioning of the portal cannula within the portal vein can be used to overcome a reduced collection rate due to portal vein occlusion.

8029 UPTAKE OF 5-METHYLTETRAHYDROFOLIC ACID BY THE RAT JEJUNUM. *(E.)* Blair, J. A.; Matty, A. J.; Razzaque, A. (Dept. Chemistry, Univ. Aston in Birmingham, Birmingham B4 7ET, England). *J. Physiol.* 250(2):221-230, 1975.

The transport of 5-methyltetrahydrofolic acid at various concentrations and different pHs in male Wistar rat jejunum was studied using an everted sac technique and an isolated mucosal cell preparation. Serosal and tissue uptake of 5-methyltetrahydrofolic acid was linear for 60 min with 10^{-5} M 5-methyltetrahydrofolic acid in the mucosal medium. Tissue uptake was much higher than serosal uptake. From studies with no initial concentration gradient of 5-methyltetrahydrofolic acid at 37 C, a mean ratio of 1.08 final mucosal concentration was obtained for a 15-min incubation period, suggesting no transport against an electrochemical gradient. At "zero" concentration gradient, the tissue appeared to concentrate 5-methyltetrahydrofolic acid from both mucosal and serosal media. Transport studies at 27 C with 10^{-5} M 5-methyltetrahydrofolic acid in the mucosal medium gave a Q_{10} value of 1.8; concentrations ranging from 10^{-7} to 10^{-4} M failed to show any saturation of uptake, indicating that movement of 5-methyltetrahydrofolic acid occurred by passive diffusion. The characteristics of 5-methyltetrahydrofolic acid uptake suggest a non-saturable transport mechanism. In uptake studies with isolated cells at pH 7.0, all the uptake took place within three min, suggesting a rapid binding of 5-methyltetrahydrofolic acid to cell surface protein rather than transport into the cell. At pH 5.0 there was a similar rapid uptake within the first three min followed by a slower but significant uptake in the next three min. This latter uptake may represent transport into the cell. It is concluded that the existence of an acid microclimate at the mucosal surface of the jejunum allows for the passive absorption of 5-methyltetrahydrofolic acid as the neutral zwitterion, and that this acid microclimate is most likely located in the glycocalyx.

8030 EFFECTS OF SUGARS ON LEUCINE AND LYSINE UPTAKE BY INTESTINAL CELLS FROM RATS FED SUCROSE AND STOCK DIETS. *(E.)* Reiser, S.; Michaelis, O. E., IV; Hallfrisch, J. (Nutr. Inst., Agr. Res. Serv., U. S. Dep. Agr., Beltsville, Md.). *Proc. Soc. Exp. Biol. Med.* 150(1):110-114, 1975.

The effects of fructose, glucose, and sucrose on the uptake of leucine and lysine by isolated rat intestinal cells was studied *in vitro*. Male weanling Wistar rats were maintained for 9-10 weeks on a commercial ground stock diet or a diet containing 65% sucrose, 20% casein-lactalbumin, 5% corn oil, 5% salt mix, 4% cellulose, and 1% vitamins. The isolated intestinal cells from these animals were incubated in a modified oxygenated Krebs-Ringer phosphate buffer containing radioactive and nonradioactive leucine or lysine (1 mM) and nonradioactive sugars (10-20 mM). The food intake and weight gain values did not differ significantly between the stock diet-fed and sucrose-fed rats. Leucine uptake by the cells was increased by adding 10 mM fructose and inhibited by adding 10 mM glucose or 20 mM sucrose to the medium; the results were similar in cells obtained from the 2 dietary groups. The major dietary effect noted was a significantly increased inhibition of leucine uptake by glucose in the sucrose-fed rats. The uptake of lysine by the intestinal cells was minimally affected by the added sugars regardless of the diet fed. These results demonstrate an important dichotomy in the properties of glucose and fructose transport in the intestine and suggest that dietary fructose may increase the transport of certain amino acids.

8031 ON THE MECHANISM OF SUGAR AND AMINO ACID INTERACTION IN INTESTINAL TRANSPORT. *(E.)*

Murer, H.; Sigrist-Nelson, K.; Hopfer, U. (Federal Inst. Technology, Zurich, Switzerland). *J. Biol. Chem.* 250(18):7392-7396, 1975.

The influence of amino acids on D-glucose transport was studied in isolated vesicles of brush border membranes from rat small intestine. Both D- and L-alanine inhibited D-glucose transport (42 and 21%, resp.), L-alanine being the more effective of the isomers. Neither L- nor D-alanine influenced the equilibrium uptake of D-glucose at the 30-min time point. Transport interaction depended on amino acid flow rather than on concentration. Preincubation of the membranes with L-alanine abolished the inhibitory effect on D-glucose uptake. Counter transport of D-glucose and L-alanine was also noted. There was no influence of L-alanine on D-glucose uptake in the absence of Na$^+$ or K$^+$. When an antibiotic (monactin or valinomycin) was added to the membranes and D-glucose and L-alanine transport were measured in the presence of a driving force (in the form of an NaSCN gradient), the concentrative, overshooting nonelectrolyte uptake was abolished. D-glucose or L-alanine transport in the absence of a driving force (after preincubation with NaSCN) was not changed by either antibiotic. The equilibrium uptake value was also unaffected by monactin or valinomycin. When the antibiotics were tested with respect to their influence on transport interaction, monactin and valinomycin released the inhibition of D-glucose uptake by L- and D-alanine. The antibiotics had no influence on D-glucose uptake in the absence of amino acids. Monactin was effective in the presence of Na$^+$ without addition of further cations; the effect of valinomycin was only observed with K$^+$ also present in the medium. These experiments provide evidence that the Na$^+$-dependent sugar and amino acid fluxes across the brush border membrane are coupled electrically.

8032 HEPATOCELLULAR UPTAKE OF BILE ACIDS IN THE DOG: EVIDENCE FOR A COMMON CARRIER-MEDIATED TRANSPORT SYSTEM. *(E.)*

Glasinovic, J. C.; Dumont, M.; Duval, M.; Erlinger, S. (Hopital Beaujon, 92110 Clichy, France). *Gastroenterology* 69(4):973-981, 1975.

This study compared the uptake of taurocholate (TC) by dog liver to the uptake of taurochenodeoxycholate (TCDC) and examined the influence of TCDC on TC uptake. Two series of experiments were performed. In the first, designed to study the influence of TCDC on TC uptake, a mixture was injected into the portal vein containing: (1) a tracer dose of (24 ^{14}C) sodium TC; (2) a known dose of unlabeled TC; and (3) a dose of 1.5 μM/kg body weight of unlabeled TCDC. The total dose of TC in the injection mixture was varied at each injection, but the dose of TCDC was the same for all experiments. In the second series, designed to compare the hepatic uptake of TC and TCDC, a mixture was injected in each experiment containing: (1) a tracer dose of (^{3}H)sodium TC; (2) a tracer dose of (24 ^{14}C)sodium TCDC; and (3) a known equimolar dose of unlabeled TC and TCDC, the equimolar dose being varied at each injection. Two reference tracers were injected simultaneously with the mixture described for each series of experiments: ^{51}Cr-labeled red cells as a vascular indicator and ^{125}I-labeled albumin as an extravascular indicator. The analysis of the dilution curves fitted well a three-compartment model, and no return of the extracted bile acids to the extracellular space was detected. The initial space of distribution of TC in the presence of a fixed dose of TCDC was approximately 1.25 times greater than that of albumin. Analysis of the data for TC uptake in the presence of TCDC was consistent with Michaelis-Menten kinetics, as previously established for TC alone. The calculated initial maximal velocity of uptake (V_{max}) of TC in the presence of TCDC was about 4.92 μM/sec/100 g of liver. This value was not significantly different from the V_{max} previously calculated for TC alone. The apparent K_d (dose of TC yielding half-maximal velocity) was approximately 18.10 μM/100 g of liver, a value significantly higher than that obtained in the absence of TCDC. A K_I (the Michaelis-type constant characterizing the inhibition of TC uptake by TCDC) of 2.71 μM of TCDC/100 g of liver was calculated. These observations are consistent with competitive inhibition of TC uptake by TCDC, and thus with the existence of a common carrier-mediated transport system for TC and TCDC. Estimation of the kinetic characteristics of the two bile acids from dilution curves obtained simultaneously showed that the affinity for the carrier was higher for TCDC than for TC but that the maximal capacity was lower for TCDC than for TC.

8033 CHARACTERIZATION OF THE PASSIVE AND ACTIVE TRANSPORT MECHANISMS FOR BILE ACID UPTAKE INTO RAT ISOLATED INTESTINAL EPITHELIAL CELLS. *(E.)*

Wilson, F. A.; Treanor, L. L. (Vanderbilt Univ. Sch. Medicine, Nashville, Tennessee 37203). *Biochim. Biophys. Acta* 406(2):280-293, 1975.

The characterization of the transport mechanisms for bile acid uptake into metabolically viable cells from rat jejunum and ileum is reported. Intestinal epithelial cells from female Sprague-Dawley rats were strained through nylon stocking material and centrifuged at 200 X *g* for 10 min. Measurements of $^{14}CO_2$ production from (1-^{14}C)glucose were performed. Glycolytic activity was determined by measuring lactate formation from glucose. All measurements of lactate production were corrected for the amount of lactate present in cells at the start of the incubation. Oxygen consumption was recorded polarographically at 27 C. The measurements were started after 1 to 4 mg of cellular protein was added to Tris buffer. The current output from the electrode was calibrated by using solutions of known oxygen content. In flux rate experiments, essentially instantaneous, unidirectional uptake rates for bile acids were determined using isolated intestinal cells. ^{14}C-labeled bile acid, ^{3}H-labeled bile acid, and unlabeled bile acid included taurocholate, taurodeoxycholate, glycocholate, glycochenodeoxycholate, glycodeoxycholate, cholate, chenodeoxycholate, and deoxycholate. Protein content was assayed in aliquots of cell suspensions. These studies demonstrated that criteria for passive diffusion of bile acids were satisfied in mucosal epithelial cells isolated from rat jejunum. The apparent permeability coefficients, P(app), for the bile acids varied in a regular manner, from 24.9 (taurocholate) to 1563 (deoxycholate) nM/min/100 mg protein/mM, dependent upon their molecular structure; from these data an incremental free energy change for the addition of a hydroxyl, glycine and taurine group to a bile acid molecule was calculated to be 892, 1040 and 1464 cal/M, resp. Following subtraction of the passive component in isolated ileal cells, complete kinetic curves for taurocholate and taurodeoxycholate yielded V(app) (maximal transport velocity) values of 109 and 70 nM/min/100 mg, resp. K_m(app) (Michaelis constant) values of 0.24 mM (taurocholate) and 0.10 mM (taurodeoxycholate) were lower than usually recorded in whole tissue. Bile acid uptake into cells from ileum, but not jejunum, was affected by temperature, metabolic factors and competitive inhibition. These studies indicate that isolated epithelial cells are a metabolically viable, relatively purified intestinal preparation which discriminate between active and passive transport processes for bile acids under conditions where unstirred water layer artifacts are minimized.

8034 HEPATIC BILE ACID TRANSPORT: EFFECT OF CONJUGATION AND POSITION OF HYDROXYL GROUPS.

(E.) Hoffman, N. E.; Iser, J. H.; Smallwood, R. A. (Austin Hosp., Heidelberg, Victoria, 3084, Australia). *Am. J. Physiol.* 229(2):298-302, 1975.

The hepatic transport of five bile acids was studied in bile fistula rats. Adult male Sprague-Dawley rats were anesthesized and the common bile duct was cannulated. The portal vein was displayed and the rate of bile flow was measured. A 0.2 ml mixture of paired, labeled bile acids in 0.9% sodium chloride was injected into the portal vein as a sharp pulse (over 1 to 2 sec), and the secretion of the radiolabel in bile was measured over the next 15 min by liquid scintillation spectrometry. Six rats were injected with a pair of bile acids, one of which was labeled with ^{14}C and the other with ^{3}H. Taurocholic acid *vs* glycocholic acid, taurocholic acid *vs* cholic acid and glycocholic acid *vs* cholic acid were the pairs tested to assess the effect of conjugation on transport. Cholic acid *vs* deoxycholic acid and cholic acid *vs* chenodeoycholic acid were tested to assess the effect of varying the number and position of hydroxyl groups. Blood was sampled from the abdominal aorta in the 10 to 15 sec following injection. The examination of isotopic ratios showed that in none of the pairs studied were the two bile acids taken up with equal efficiency. Taurocholic acid was transported most efficiently, followed in order by glycocholic acid, cholic acid, deoxycholic acid and chenodeoxycholic acid. In every case the bile acid secreted more slowly appeared in greater amounts in the systemic blood. This suggests that hepatic uptake is a significant determinant of the differences in secretion rate, but that differential rates of movement across the cell may further influence the ultimate secretion profiles.

8035 EFFECT OF BILE SALTS ON AMINO ACID TRANSPORT BY RABBIT INTESTINE.

(E.) Hajjar, J. J.; Khuri, R. N.; Bikhazi, A. B. (Sch. Medicine American Univ. Beirut, Beirut, Lebanon). *Am. J. Physiol.* 229(2):518-523, 1975.

The effect of bile salts on alanine absorption across four regional sites of rabbit intestine was examined using an *in vivo* single pass perfusion technique. The rabbits were tracheotomized and perfused with bile salt solution. The perfusion rate was constant at 0.28 to 0.30 ml/min. Effluent solutions were collected 45, 65, 85, and 105 min after the start of the perfusion. The mucosal-to-serosal flux (J_{ms}) and serosal-to-mucosal flux (J_{sm}) were measured in the presence and absence of different concentrations of Na-taurodeoxycholate (TDC). Na-deoxcholate (3 mM) reduced alanine absorption across all levels of intestine, and a higher concentration (10 mM) of TDC caused only a minimal reduction of alanine absorption in the jejunum. TDC was more effective in *in vitro* experiments, causing an increase in the transmural J_{sm} of alanine and phenylalanine, particularly when it was present in both the mucosal and serosal fluids. TDC reduced the alanine J_{ms} rate when present only in the mucosal fluid. TDC decreased the influx of amino acids across the mucosal brush border membrane. These amino acids transport changes correlated with some observed histological changes of the intestinal epithelium. Bile salt inhibition of amino acid absorption appeared to be nonspecific in type and could be the result of injurious action of these surface-active agents on the intestine. More direct studies of this inhibitory action of bile salts are necessary to further characterize the exact nature of this injury.

8036 THE EFFECT OF SOME IONIZED AND NEUTRAL SURFACTANTS AND BILE ACIDS UPON SODIUM AND WATER TRANSPORT FROM TIED JEJUNAL LOOPS IN ANAESTHETIZED RATS.

(E.) Sund, R. B. (Inst. Pharmacy, Univ. Oslo, Oslo, Norway). *Acta Pharmacol. Toxicol.* 37(4):297-308, 1975.

The effects of various surfactants and of unconjugated and conjugated bile acids on the jejunal transport of sodium and water was investigated. The surfactants included dioctylsulphosuccinate, cetrimonium bromide, benzalkonium chloride and various nonionic surfactants, and the acids included desoxicholic acid and its glycine and taurine conjugates, cholic acid, and dehydrocholic acid. Anesthetized male rats were prepared with a tied jejunal segment (15 cm long) into which 2.0 ml test solution was instilled. After given periods of time the loops were removed, drained and washed. The amount of sodium recovered was determined by flame photometry and the amount of unabsorbed fluid by an indirect, gravimetric procedure. Dioctylsulfosuccinate sodium, benzalkonium chloride and cetrimonium bromide all inhibited sodium absorption and were capable of inducing net sodium secretion at high concentration. Most of the nonionic surfactants failed to alter sodium absorption significantly: Pluronic F68 had a slight inhibitory effect; Triton X100 (0.5%) inhibited sodium absorption completely; and Lubrol WX (0.5%) induced net secretion. Cholic acid and desoxicholic acid caused net secretion at higher concentrations, while glyco- and taurodesoxicholic acid were significantly inhibitory at 12.8 nM. Dehydrocholic acid had very little effect on net sodium absorption and appeared dose-dependent. The testing of active compounds with hypertonic sodium sulfate revealed an augmented absorption of sodium. It is concluded that several substances of widely differing chemical structure have the same effect on the jejunal transport of water and sodium. This effect is probably due to some common physicochemical property, such as the surface activity of the compounds. It was also concluded that the observed change in transport pattern indicated that the surfactants caused increased passive permeability of the intestinal epithelium.

8037 REGIONAL DIFFERENCES IN THE EFFECT OF BILE SALTS ON ABSORPTION BY RAT SMALL INTESTINE IN VIVO. *(E.)* Saunders, D. R. (Dept. Biochemistry, Univ. Oxford, Oxford, England). *J. Physiol.* 250(2): 373-383, 1975.

The possible regulation of luminal water by bile salts in male Wistar and Sprague-Dawley rats was tested by examining the relation between taurocholate concentration and water transport in different regions of the rat small intestine. Net water transport was measured under steady-state conditions during single-pass infusion of segments from three regions of the small intestine. Each segment served as its own control. Taurocholate (5 mM), glycocholate (5 mM), and delipidated rat bile depressed water absorption in rat proximal jejunum but not in distal ileum. Water absorption in the ileum was uninhibited by concentrations of taurocholate up to 20 mM. Similar regional differences in the effect of bile salts on glucose absorption were noted. The ileum was less sensitive than the jejunum to the antiabsorption effect of 1 mM of deoxycholate. The addition of 1-palmitoyl,2-oleoyl lecithin (2-5 mM) counteracted the inhibitory effect of taurocholate and glycocholate on water absorption. Net water transport, a percentage of the control period, was inversely related to $\log_{10}$ (taurocholate concentration of infusate). These data are consistent with the observations on the cathartic effect of conjugated bile salts in human small intestine. The extent to which endogenous bile salts influence the fluidity of rat small intestinal contents depends on regional differences in absorptive functions. It is suggested that the bile salt active transport system conserves the bile salts, water, and electrolytes delivered to the rat ileum.

8038 SALMON CALCITONIN AND WATER AND ELECTROLYTE TRANSPORT IN RABBIT ILEUM. *(E.)* Gray, T. K.; Juan, D.; Powell, D. W. (Univ. North Carolina Sch. Med., Chapel Hill). *Proc. Soc. Exp. Biol. Med.* 150(1):151-154, 1975.

The effect of synthetic salmon calcitonin and partially purified salmon calcitonin on water and electrolyte transport in the rabbit ileum was studied using an *in vivo* perfusion technique and the *in vitro* Ussing chamber technique in male New Zealand white rabbits. The salmon calcitonin was administered by i.v. infusion (1-10 U/kg/hr) or by direct addition to the Ussing chamber solutions (10-144 U/ml). In addition to the transport rates of Na, Cl, and water across the ileum, determinations were made of the serum calcium concentrations, Na and Cl fluxes, potential differences, short-circuit current, and conductance. The administration of salmon calcitonin by i.v. infusion or by addition to the Ussing chamber had no detectable effect on water or electrolyte transport in the rabbit ileum. Similarly, no significant differences in the Na and Cl flux rates or the electrical measurements were detected when calcitonin-treated tissues were compared with control tissues; the addition of large doses (36-144 U/ml) of synthetic calcitonin to the Ussing chamber was, however, associated with a brief (less than 4 min) 25% increase in potential difference and short-circuit current. *In vivo* 3 U/kg/hr calcitonin significantly decreased the serum calcium level. In contrast to its effect in man, salmon calcitonin fails to influence the ileal transport of water and electrolytes in the rabbit. This may be due to differences in rabbit intestinal response to a foreign peptide hormone.

8039 INHIBITION OF INTESTINAL CALCIUM TRANSPORT BY LOCAL ANESTHETICS. *(E.)* Wrobel, J.; Michalska, L. (Dept. Biochem., Medical Sch., A. Zwycięstwa 42, 80-210 Gdansk, Poland). *Physiol. Chem. Physics* 7(3):209-214, 1975.

The inhibition of active calcium transport in Wistar rat duodenum by local anesthetics, including nupercaine, butacaine hemisulfate, lidocaine HCl, and procaine HCl was demonstrated. Calcium transport was studied *in vitro* using the everted sacs technique or special glass devices. Duodenal sacs were filled with 0.5 ml of medium and incubated in 5 ml of medium. Concentrative calcium transport was calculated from the difference between the amount of ^{45}Ca in the total final sac content and the amount in the initial sac content. Measurements of unidirectional transport were performed on everted duodenal segments. The rate of transport of a compound was calculated on the basis of the specific activity of the isotope in the compartment from which transport was occurring and the rate of the isotope appearance in the other compartment. All drugs tested strongly inhibited active calcium transport in a concentration-dependent fashion; nupercaine was the most effective. The inhibitory activity of the other anesthetics decreased in the following order: butacaine, lidocaine, procaine. The inhibitory effect of local anesthetics on intestinal calcium transport closely correlated with their anesthetic potency. The increase of $CaCl_2$ concentration (from 0.4 mM to 5.0 mM) had no effect on the degree of inhibition of calcium transport in the presence of all the anesthetics tested. Nupercaine exerted directionally oriented action on calcium transport; it inhibited mucosa-to-serosa transport but did not effect serosa-to-mucosa transport. With 1.0 mM nupercaine present in the medium, calcium transport in both directions was equal. In the absence of nupercaine, calcium transport from mucosa to serosa was four times that of the transport in the opposite direction. Thus, the observed influence of nupercaine is not due to a simple difference in the permeability of duodenum for calcium ions, but rather to the inhibition of the active mechanism mediating calcium transport. In addition, the results suggest that the action of nupercaine is different from that of other metabolic inhibitors.

8040 THE INFLUENCE OF DIETARY CALCIUM AND PHOSPHORUS ON INTESTINAL CALCIUM TRANSPORT IN RATS GIVEN VITAMIN D METABOLITES. *(E.)* Ribovich, M. L.; DeLuca, H. F. (Coll. Agriculture Life Sci., Univ. Wisconsin, Madison, Wisc. 53706). *Arch. Biochem. Biophys.* 170(2):529-535, 1975.

The effects of dietary calcium (0.02%, 1.2%, or 2.0%) and phosphorus (0.1% or 0.3%) on intestinal calcium transport were studied in male weanling rats (Holtzman) given p.o. vitamin D_3 (25-1000 ng daily), 25-hydroxyvitamin D_3 (25-OH-D_3, 12.5-250 ng daily), or 1,25-dihydroxyvitamin D_3 (1,25-[OH]$_2$D$_3$, 7-25 ng daily p.o. or 12.5 ng daily s.c.). The rats were maintained on the experimental diets for three weeks; supplementation with vitamin D or metabolites was begun on the fifth or seventh day and continued throughout the remainder of the period. Intestinal adaptation to low calcium intakes occurred when the rats were supplemented daily with 250, 625, or 1000 ng of vitamin D_3, but not when they were given only 25 ng; the adaptive response was prolonged with increasing dosages of vitamin D_3. Similarly, rats given 12.5 ng of 25-OH-D_3 did not show a significant increase in intestinal calcium transport due to the low calcium diet, while intestinal adjustment to low dietary calcium levels was observed with dose levels of 25-250 ng. 1,25-(OH)$_2$D$_3$ did not affect the adaptation of intestinal calcium transport to dietary calcium. Low dietary phosphorus levels stimulated intestinal calcium transport to a greater extent than low dietary calcium levels. The stimulation of calcium transport by the low phosphorus diet was observed at all times following the last dose of either vitamin D_3 or 25-OH-D_3 as compared to the normal phosphorus diet. However, the elevation of intestinal calcium transport by low phosphorus diets was not eliminated by the administration of exogenous 1,25-(OH)$_2$D$_3$. The results suggest that in addition to stimulating 1,25-(OH)$_2$D$_3$ synthesis, low phosphorus diets must have some other unknown effect on intestinal calcium transport and that the stimulation of intestinal calcium transport by low dietary calcium is the direct consequence of increased 1,25-(OH)$_2$D$_3$ synthesis.

8041 POTASSIUM TRANSPORT ACROSS DISTAL COLONIC MUCOSA IN MAN [abstract]. *(E.)* Salas-Coll, C.; Kermode, J.; Edmonds, C. J. (Univ. Coll. Hosp. Med. Sch., London, England). *Gut* 16(5):408, 1975.

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8046 PARTIAL STARVATION ENHANCE POLYGLUTAMYL AND MONOGLUTAMYL FOLATE ABSORPTION IN RAT INTESTINE [abstract]. *(E.)* Solomons, N. W.; Chang, H.; Rosenberg, I. H. (Dept. Med., Univ. Chicago, Chicago, Ill.). *Gastroenterology* 68(4): 1063, 1975.

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8071 EFFECTS OF SYNTHETIC HUMAN GASTRIN I UPON MOVEMENTS OF WATER, ELECTROLYTES AND GLUCOSE ACROSS THE HUMAN SMALL INTESTINE. *(E.)* Modigliani, R.; Mary, J. Y.; De Peyer, R.; Bernier, J. J. (INSERM U-54, Hopital St-Lazare, F-75010 Paris, France). *Digestion* 11(5-6):452-453, 1974.

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8076 MECHANISM OF THE INTESTINAL ABSORPTION OF DRUGS FROM OIL IN WATER EMULSIONS. IV. ABSORPTION FROM EMULSIONS CONTAINING THE HIGHER CONCENTRATION OF EMULSIFIER. *(E.)* Ogata, H.; Kakemi, K.; Muranishi, S.; Sezaki, H. (Faculty Pharmaceutical Sci., Kyoto Univ., Kyoto, Japan). *Chem. Pharm. Bull.* 23(4):707-715, 1975.

8077 THE EFFECT OF LACTOSE ON IN VIVO CALCIUM TRANSPORT IN THE RAT [abstract]. *(E.)* Urban, E.; Pena, M. (Univ. Texas Health Sci. Cent., San Antonio, Tex.). *Clin. Res.* 23(3):462A, 1975.

8078 ROLE OF NA-K-ATPASE IN INTESTINAL ELECTROLYTE TRANSPORT AFTER ADRENAL STEROIDS [abstract]. *(E.)* Charney, A. N.; Kinsey, M. D.; Myers, L.; Giannella, R. A.; Gots, R. E. (Walter Reed Army Inst. Research, Washington, D. C.). *Clin. Res.* 23 (3):247A, 1975.

8079 INCREASED AMINO ACID TRANSPORT IN PREGNANT GUINEA PIG INTESTINE [abstract]. *(E.)* Hutcheson, D.; Tumbleson, M.; Butt, J. (Dept. Med., Univ. Missouri, Columbia, Mo.). *Clin. Res.* 23(3): 249A, 1975.

8080 MECHANISMS OF ELECTROLYTE ABSORPTION FROM PERFUSED RAT ILEUM [abstract]. *(E.)* Humphreys, H. (Univ. Calif. Renal Cent., San Francisco General Hosp., San Francisco, Calif.). *Clin. Res.* 23(3):249A, 1975.

8081 SMALL INTESTINE ABSORPTION OF BACTERIALLY SYNTHEISIZED VITAMIN K-2 [abstract]. *(E.)* Hollander, D.; Rim, E. (Div. Gastroenterol., Wayne St. Univ., Detroit, Mich.). *Clin. Res.* 23(3):249A, 1975.

8082 EFFECT OF ETHANOL ON STRUCTURAL AND FUNCTIONAL INTEGRITY OF RAT INTESTINE AND ITS EFFECT OF L-PHENYLALANINE UPTAKE AND TRANSPORT [abstract]. *(E.)* Kumar, G. K.; Muralidhara, K. S.; Hollander, D. (Dept. Med., Wayne State Univ., Detroit, Mich.). *Clin. Res.* 23(3):252A, 1975.

8083 EFFECT OF DIETARY CALCIUM RESTRICTION ON CALCIUM UPTAKE BY ISOLATED CHICK INTESTINAL MITOCHONDRIA [abstract]. *(E.)* Krawitt, E. L.; Kunin, A. S.; Bacon, B. (Dept. Med., Univ. Vermont, Burlington, Vt.). *Clin. Res.* 23(3):252A, 1975.

8084 LIMITATION OF INTESTINAL ABSORPTION OF VITAMIN C (VIT C) IN HIGH DOSES [abstract]. *(E.)* Nelson, E. W.; Cerda, J. J. (Dept. Med., Univ. Florida, Gainesville, Fla.). *Clin. Res.* 23(3):254A, 1975.

8085 ANALYSIS OF RATE CONTROLLING PROCESSES IN POLYGLUTAMYL FOLATE ABSORPTION [abstract]. *(E.)* Wagonfeld, J. B.; Dudzinski, D.; Rosenberg, I. H. (Dept. Med., Univ. Chicago, Chicago, Ill.). *Clin. Res.* 23(3):259A, 1975.

8086 INTESTINAL ABSORPTION AND METABOLISM OF α-KETO β-METHYLVALERATE (KI) [abstract]. *(E.)* Weber, F. L.; Maddrey, W. C.; Walser, M. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Clin. Res.* 23(3):260A, 1975.

See also, 8143, 8165, 8204, 8216, 8354, 8356, 8358, 8553, 8757.

8087 EFFECTS ON GASTRIC MOTILITY FROM THE CEREBELLAR FASTIGIAL NUCLEUS. *(E.)* Lisander, B.; Martner, J. (Dept. Physiology, Univ. Goteborg, Goteberg, Sweden). *Acta Physiol. Scand.* 94(3):368-377, 1975.

The fastigial influence on gastric motility in 43 chloralosed cats was investigated, and the nervous mechanisms involved were analyzed. The ability of fastigial stimulation to produce either gastric excitation or relaxation and the background of these responses were investigated by selective nerve sectioning and the administration of suitable autonomic blocking agents. Gastric motility was measured as volume changes in a large intragastric waterfilled balloon inserted into the stomach via esophagus. Pharmacological adrenergic blockade was induced by guanethidine (4-5 mg/kg body weight i.v.) alone or in combination with phentolamine (3 mg/kg body weight i.v.) and propranolol (0.5-1.0 mg/kg body weight i.v.). For cholinergic blockage, atropine sulfate (0.5-1.0 mg/kg body weight i.v.) or methylscopolamine (0.015-0.03 mg/kg body weight i.v.) was used. Suppression of prevailing gastric motility was found to be mediated mainly by increased discharge in adrenergic nerve fibers and also by adrenal catecholamine release. Gastric excitation could be induced in three different ways: first, *via* increased activity in vagal cholinergic fibers; second, by fastigial suppression of vago-vagal nonadrenergic relaxatory reflex. In addition, when laparotomy or other noxious abdominal stimuli had induced inhibitory gastric reflexes, the consequent sympathetic discharge could be suppressed by fastigial stimulation resulting in enhanced gastric motility. The importance of background activity in the various nervous pathways for the fastigially induced gastric responses is discussed.

8088 GASTRIC EMPTYING AND ITS RELATIONSHIP TO ANTRAL CONTRACTILE ACTIVITY. *(E.)* Stemper, T. J.; Cooke, A. R. (Veterans Hosp., Univ. Iowa, Iowa City, Iowa). *Gastroenterology* 69(3): 649-654, 1975.

Simultaneous measurements of gastric emptying and antral contractile activity in three dogs with gastric and duodenal fistulas were taken to determine the relation between antral contractions and the volume emptied. Two force strain gauge transducers were sewn to the serosal surface of the antrum of two dogs and a single strain gauge transducer was sewn on the serosal surface of both the antrum and fundus of the third dog. The frequency and the force of antral contractions were determined. Contractile activity was recorded simultaneously with gastric emptying and the number of contractions in each one-min period were counted. The measurements were begun three weeks after the operation and five min after the instillation of the test meal, and were continued for 15 min. The test meals (154 mM saline) of 60, 120, 240 or 480 ml were warmed to 37 C and instilled rapidly into the stomach *via* the gastric fistula. As the number of contractions/min increased (reaching a maximum at about four contractions/min), so did the volume emptied/min. Rapid gastric emptying was usually associated with an increase in the force of contractions. However, no contractions were recorded when a mean volume of 6.9 ml/min was delivered to the duodenum; 0-96 ml/min were emptied during maximal antral activity. Antral contractile activity increased with the size of the test meal, and decreased exponentially with the rate of gastric emptying. Fundal contractile activity was not present during the test meal. These studies suggest that although the antrum plays a significant part in the emptying of liquids from the stomach, other factors, such as the pylorus, the proximal stomach, and the proximal duodenum may modify its effects.

8089 THE EFFECT OF MANOMETRIC ASSEMBLY DIAMETER ON INTRALUMINAL ESOPHAGEAL PRESSURE RECORDING. *(E.)* Lydon, S. B.; Dodds, W. J.; Hogan, W. J.; Arndorfer, R. C. (Med. Coll. Wisconsin, Milwaukee). *Am. J. Dig. Dis.* 20(10):968-970, 1975.

The effect of manometric assembly diameter on the upper esophageal sphincter pressure and the peristaltic pressure amplitude in the esophageal body was studied in 6 normal human volunteers aged 18-22 yr. The manometric tube assembly featured 3 recording levels designated A, B, and C and measuring 3.3, 4.8, and 6.7 cm in diameter, resp. The assembly circumference at these 3 recording levels was 11, 17, and 22 mm, resp. After nasal intubation, the resting lower esophageal sphincter and upper esophageal sphincter pressure and peristaltic pressure complexes in the distal and proximal esophagus were recorded for each assembly diameter. The results indicated that increases in assembly diameter caused significant increases in the peristaltic pressure amplitudes and resting sphincter pressures in the smooth and striated muscle portions of the esophagus. This phenomenon is best explained by the length-tension characteristics of the esophageal muscle. Because recording assemblies produce luminal distension, the assembly causes radial stretch of circular esophageal muscle. The extent of this stretch is directly related to assembly diameter and circumference. These findings indicate that it is necessary to standardize manometric assembly diameter to permit valid comparison of esophageal pressure values obtained by different investigators.

8090 ELECTRICAL STIMULATION OF SMALL INTESTINAL ELECTRICAL CONTROL ACTIVITY. *(E.)* Sarna, S. K.; Daniel, E. E. (Depts. Surgery and Electrical Engineering, McMaster Univ., Hamilton, Ontario, Canada). *Gastroenterology* 69(3):660-667, 1975.

A study was made of electrically controlled motility in the small intestine of healthy female dogs. The electrical control activity (ECA) in the small intestine was driven by an electrical stimulus and the effects on the frequency and phase relations of control waves were recorded. The ECA in the small intestine could be driven from all sites from which it could be recorded. The mean maximum driven frequency (MDF) was highest near the pylorus (25.3 cycles/min), but decreased distally (14.1 cycles/min) at 10 cm from the ileocecal junction. However, at any given site, it was the same both before and after the small intestine was divided into small segments (10-25 cm long). With an increase in plateau frequency, the length of the frequency plateau decreased and phase lag/cm increased. The direction of phase lag was orad proximal to a stimulation site and aborad distal to it. No effect was noted on the MDF in the frequency plateau region by atropine (up to 100 μg/kg, i.v.) or reserpinization of dogs before the experiment. The results confirm the validity of an array of bidirectionally coupled relaxation oscillators as a model of small intestinal ECA. It is concluded that electrical stimulation can be used to alter the small intestinal ECA frequency and phase relation among control waves. In addition, differences between the gastric and small intestinal ECA's were observed at the cellular level.

8091 A LINKED OSCILLATOR MODEL OF ELECTRICAL ACTIVITY OF HUMAN SMALL INTESTINE. *(E.)*

Brown, B. H.; Duthie, H. L.; Horn, A. R.; Smallwood, R. H. (Weston Park Hosp., Sheffield, S10 2SJ, England). *Am. J. Physiol.* 229(2):384-388, 1975.

A model was constructed in which the electrical slow-wave activity of the human small intestine was simulated by a series of 64 coupled electronic relaxation oscillators with a gradient of intrinsic frequencies. The wave output form was one in which the slope of the curve increased with time except at the turning points. Coupling between adjacent oscillators was intrinsically bidirectrional, and the values of coupling between oscillators were uniform. Using only two coupled oscillators of different intrinsic frequencies, it was shown that as coupling was increased there came a point where the two oscillators ran at the same frequency. This frequency was at first raised above the intrinsic frequency of either oscillator and then fell progressively as coupling was increased. When all 64 oscillators were coupled at the same resistance, a frequency plateau of 12/min was formed for the first 20 oscillators; thereafter, there was a frequency gradient decreasing to 9/min. The frequency of the plateau was close to that of the first oscillators, all the other oscillators being raised above their intrinsic frequencies. While the frequency of the oscillators on the plateau was constant, the frequencies of the other oscillators fluctuated by about 5%. The length of the frequency plateau was decreased with a steeper frequency gradient and/or a decreased coupling factor. The phase shift between adjacent oscillators increased with distance down the plateau. Similarly, the cycle-to-cycle stability of the oscillators decreased distally. Although the phase relation of adjacent oscillators was almost constant with respect to time over most of the frequency plateau, this was not the case for the frequency gradient or escalator region; here it was found that batches of up to 20 adjacent oscillators could be in the same state. This batch of oscillators formed at the edge of the frequency plateau, then traveled down the model. The transit time of the group increased with decreasing coupling but was relatively unaffected by intrinsic frequency gradient. While this electronic analog model is based on inadequate physiological data regarding the size of oscillators and their intrinsic frequencies and coupling, it does mimic many properties of the intact small intestine.

8092 EFFECTS OF ESSENTIAL AND NONESSENTIAL AMINO ACIDS ON GASTRIC EMPTYING IN THE DOG. *(E.)*

Stephens, J. R.; Woolson, R. F.; Cooke, A. R. (Dept. Medicine, VA Hosp., Iowa City, Iowa 52240). *Gastroenterology* 69(4):920-927, 1975.

The aim of the research was to define the effects of amino acids on gastric emptying in healthy dogs. Five dogs with gastric fistulas (a Thomas cannula was put into the most dependent part of the stomach) were used (begun about 3 wks postoperatively and continued over a period of 7 months) to assess the effect on gastric emptying of: (1) two potent cholecystokinin (CCK) releasers, tryptophan and phenylalanine, and of six other essential amino acids; (2) the nonessential amino acids alanine, beta-alanine, arginine, asparagine, aspartic acid, citrulline, cysteine, cystine, glutamic acid, glutamine, D-glutamine, histidine, hydroxyproline, ornithine, proline, serine, tyrosine, and D-tryptophan; (3) four peptide and amino acid preparations; and (4) solutions of glucose, glycine, and mannitol. A plastic adapter with a stopcock was connected to the gastric cannula through which the test meals (two 25-min test meals, the first being a control, given in succession, with at least 20 min between each meal) were instilled and drained. Phenol red concentration (of the gastric contents) after alkalinization was determined spectrophotometrically at a wavelength of 558 nm. Of the essential amino acids, only tryptophan significantly slowed emptying, and only above 4 mM was there a difference between control and test meal. The delay in response to tryptophan was dose-related and approached maximum at 40 mM; D-tryptophan had no effect at these concentrations. In concentrations up to 80 mM, none of the nonessential amino acids slowed emptying significantly. The four peptide and amino acid preparations in concentrations ranging from 80 to 700 mOsM had dose responses identical to those of D-glucose, glycine, and mannitol at similar osmolalities. It is concluded that L-tryptophan, which is dose-dependent and stereospecific, is a uniquely potent delayer of gastric emptying in the dog. Phenylalanine did not slow emptying, which suggests that CCK release may not be the only mechanism by which tryptophan acts. The peptide and amino acid preparations (casein hydrolysate, Bacto-peptone, Amigen, FreAmine) seem to delay emptying by stimulation of osmoreceptors, which is distinct from the mechanisms of action of tryptophan.

8093 INSULIN-SECRETION AND INTESTINAL MOTILITY. *(Fr.)*

Ruckebusch, M.; Fioramonti, J. (Laboratoire de Physiologie-Pharmacodynamie, ERA #271 CNRS, Ecole Nationale Veterinaire, 31076 Toulouse Cedex, France). *C. R. Soc. Biol.* 169(2): 435-439, 1975.

The relation between the variations in intestinal motor behavior and the release of endogenous insulin in species in which the motility during interdigestive spasms was similar was investigated in dogs and sheep. Simultaneous control of insulinemia, glycemia and electrical activity in the intestine was performed. Three dogs (15 kg each) and three sheep (40 kg each) underwent an electromyogram of the jejunal wall for two to three hr/day. The results were quantified 24 hr/day for two months. Blood glucose levels in a 24-hr fasted animal were determined 40 and 20 min prior to, and every 20 min for 8 hr after each of the following activities: a meal, an insulin injection, a glucose perfusion, and a short chain fatty acid perfusion. In the dog, glucose perfusion had little effect, but p.o. administration of glucose induced intense jejunal activity as well as a tenfold insulin release. A 500 g meat meal resulted in an insulin response equal to a third of that resulting from an endogenous insulin. Glucose levels inincreased in all situations except after insulin injection. In sheep, ingestion of 1 kg of hay or perfusion with 1 mM/kg of a mixture of short chain fatty acids had little effect on endogenous insulin release. An intense jejunal activity was noted after perfusion with 1 mM/kg of sodium butyrate, which indicated higher than normal glucose levels. Intestinal motility in dogs appeared to be linked to insulin secretion. The measurements found in sheep might have been a result of unique factors in sheep glucose metabolism. The results indicate that insulin release induced by nutrients plays a major role in the control of intestinal motility in both species.

8094 EFFECTS OF SECRETIN AND CHOLECYSTOKYNIN ON MOTOR ACTIVITY OF HUMAN JEJUNUM. *(E.)*

Dollinger, H. C.; Berz, R.; Raptis, S.; Von Uexkull, T.; Goebell, H. (Cent. Intern. Med. Pediatr., Univ. Ulm, Germany). *Digestion* 12(1):9-16, 1975.

The effects of i.v. secretin (1-2 U/kg/hr) and cholecystokinin (CCK, 1-2 U/kg/hr) on the motility of the human jejunum were studied in normal subjects, aged 20-25 yr. Motility was measured *via* pressure-sensitive radiotelemetering capsules which were ingested by the subjects; measurements were made during the infusion of saline (15 ml/hr) and during infusion of the 2 hormones at 2 dosage levels each. Secretin induced a significant and dose-dependent inhibition in the amplitude and duration of type I (nonrhythmic) and type III waves. No significant change occurred in the number of waves, amplitude index, motility index, or percentage of motor activity with 1 U/kg/hr secretin, but all of these parameters were significantly reduced by 2 U/kg/hr. CCK (1 U/kg/hr) significantly increased the amplitudes of the type III waves, but did not affect their duration or the amplitude or duration of type I waves. This dose had no obvious influence on the number of waves or the percentage of motor activity, but the amplitude index and motility index were significantly elevated. At a dose of 2 U/kg/hr, CCK increased the amplitudes, but not the durations, of both type I and type III waves; it also significantly increased the mean number of waves, the amplitude index, the motility index, and the percentage of motor activity. These findings suggest that secretin and CCK are involved in the mechanism modulating the motor function of the intestine. Since previous investigations demonstrated that the effects of CCK can be changed by p.o. administration of belladonna or by scopolamine *in vitro*, excitory cholinergic components may be present. Therefore, it is likely that CCK participates in the homeostatic mechanism controlling the neural regulation of intestinal motility.

8095 ACTION OF METIAMIDE ON THE LOWER ESOPHAGEAL SPHINCTER. *(E.)*

Cohen, S.; Snape, W. J., Jr. (Hosp. of Univ. Pennsylvania, 3400 Spruce St., Philadelphia 19104). *Gastroenterology* 69(4): 911-919, 1975.

The action of metiamide (*N*-methyl-*N*'-{2-[(5-methylimidazol-4-y)methylthio]ethyl}-2-thiourea), an H_2 antagonist, was tested for its effect upon lower esophageal sphincter (LES) function in the anesthetized opossum species, *Didelphis virginiana*. After successful anesthesia, a heparin-treated cannula was inserted into the femoral vein of the test animals. Metiamide was administered as a constant i.v. infusion. Intraluminal pressures were measured through water-filled polyvinyl catheters connected to external transducers. LES pressure was recorded as mm of Hg with gastric fundal pressure used as a zero reference. Gastric secretion was obtained by continuous suction through a collecting tube with perforations four to eight cm below the distal pressure recording site. Specimens were collected over 10-min intervals. Control values of LES pressure were obtained after insertion of the i.v. cannula and before the instillation of drugs or hormones. A period of one hr for stabilization to baseline levels was observed after administration of each agent. Studies *in vivo* were performed using gastrin I (residue 2-17; hexadecapeptide amide) or metiamide. All studies were performed utilizing the continuous i.v. infusion of gastrin or metiamide over a one-hr period. Doses of gastrin or metiamide were given in random order. Studies *in vitro* were performed with circular smooth muscle of the distal esophagus at the region of the LES. The LES was identified by manometry, and was marked. In studies using a combination of metiamide with either gastrin or histamine, the metiamide was given prior to the other agent. In these studies, each muscle served as its own control. In additional isometric studies, muscle responses were evaluated during depolarization with 60 mM KCl. In these studies, the muscle was contracted submaximally with KCl and then was tested to either histamine or gastrin at the concentration shown to give the maximal active tension. The inhibitory responses to gastrin or histamine in this setting were evaluated for antagonism by metiamide (using isoproterenol or electrical stimulation of 60 v, 10 Hz for 1.0 msec). I.v. infusions of metiamide gave a dose-related increase in LES pressure. A maximum increase in pressure of 17 mm Hg was attained at 2.0 mg/kg-hr of metiamide. This dose of metiamide abolished acid secretion in response to gastrin I, but augmented the maximal LES response to this hormone. Studies *in vitro* showed that metiamide augmented the maximal LES muscle responses to gastrin I or histamine but had no effect on other agonist responses. Metiamide alone did not alter LES muscle tension. An inhibitory response to gastrin I or histamine could be demonstrated in the presence of atropine or diphenhydramine, resp., on muscle that had first been depolarized with KCl. These inhibitory responses were antagonized by metiamide. These studies indicate that metiamide (a) increases LES pressure, (b) selectively augments LES muscle excitatory responses to gastrin I or histamine, and (c) selectively antagonizes inhibitory muscle responses to histamine or gastrin I.

8096 THE MOTOR-STIMULATING EFFECT OF METOCLOPRAMIDE AND PYRIDOSTIGMINE BROMIDE IN NORMAL MAN AND LAPAROTOMIZED PATIENTS. A COMBINED STUDY OF DUODENAL ELECTRIC AND MOTOR ACTIVITY. *(Eng.)* Oigaard, A. (Righospitalet, Blegdamsvej 9, Copenhagen, DK-2100, Denmark). *Scand. J. Gastroenterol.* 10(5): 65-71, 1975.

The effects of metoclopramide (40 mg by i.v. drip infusion) and pyridostigmine bromide (1.5 mg by i.v. drip infusion) on duodenal motility were compared in 40 normal volunteers (20-35 yr old) and in eight patients (2 and 48 hr after i.p. operations). Motility was measured by means of simultaneous recordings of electrical action potentials (spike potentials) and intraluminal pressure variations; both probes were placed in the distal part of the descending duodenum. Both drugs caused a shift towards greater motility in the normal subjects. The increase was significant one min after metoclopramide administration and 5 min after pyridostigmine bromide administration; it was significantly greater after the former than after the latter. The increase in activity was also indicated by significant increases in the frequency of spike potential occurrence after drug administration; again, the increase was greatest after metoclopramide administration. Average activity was increased significantly after both drugs, but the increase was significantly greater with metoclopramide than with pyridostigmine bromide. The average activity before drug administration was significantly lower in the i.p. surgery patients than in the normal subjects. None of the patients showed any significant change in activity after metoclopramide or pyridostigmine bromide. The results suggest that metoclopramide may possibly be preferable to the commonly used parasympathomimetics for the stimulation of bowel function after abdominal surgery.

8097 REFLEXOGENIC CONTRACTION OF THE ILEOCECAL SPHINCTER IN THE CAT FOLLOWING SMALL OR LARGE INTESTINAL DISTENTION. *(E.)* Pahlin, P. E.; Kewenter, J. (Dept. Surgery III, Sahlgrenska sjukhuset, Univ. Göteborg, Sweden). *Acta Physiol. Scand.* 95(1):126-132, 1975.

The effect of distension of a small or large intestinal loop on the feline ileo-cecal sphincter (ICS) was studied *in vivo* in adult male and female cats using a flow recording technique. Intestinal loops from the jejunum, ileum, and colon were prepared and used for intestinal distension or to record the motor activity. In some experiments, spinal anesthesia was employed, and in nine cases intestinal distention was performed before and after cervical vagotomy with or without cutting of the pelvic nerves. In addition, in some animals the two major splanchnic nerves were divided subdiaphragmatically and/or the lumbar colonic nerves were cut. I.v. atropine (1 mg/kg), phenoxybenzamine (5 mg/kg), propranolol (1-2 mg/kg), guanethidine (3 mg/kg), tetracain grave (10 mg/kg), and mepivacain chloride (20 mg/kg) were also used. Distension of a jejunal, ileal, or proximal colonic loop reduced or stopped the trans-sphincteric flow in all cases. The sphincter contraction was obtained at a distension pressure between 30 and 100 cm of H_2O. Concomitant with this contraction was an inhibition of tone and motor activity in the isolated intestinal loops. No relaxation of the sphincter was recorded when the intestinal distention was repeated after the tone of the sphincter had been increased by efferent splanchnic nerve stimulation or by distension of another intestinal segment. Similarly, no difference was observed in the sphincteric response to intestinal distension before and after the adrenal glands had been ligated; the intestino-ileo-cecal sphincteric reflex was unchanged after the vagal and/or pelvic nerves were cut; and the reflexogenic sphincter contraction was unchanged or reduced to only a minor extent after bilateral splanchnic nerve section. However, the contraction was totally or nearly totally abolished when the lumbar colonic nerves and splanchnic nerves were cut. The spinal anesthesia experiments indicated that the reflex was spinal. Atropine and propranolol did not block the contraction reflex, but guanethidine and phenoxybenzamine did. The results indicate that the excitatory intestino-ileo-cecal sphincteric reflex is a spinal reflex with the main afferent and/or efferent fibers located within the major splanchnic and colonic nerves. The excitatory motor response in the sphincter is adrenergic and mediated *via* α-receptors.

8098 INFLUENCE OF PUDENDAL BLOCK ON THE FUNCTION OF THE ANAL SPHINCTERS. *(Eng.)* Frenckner, B.; Euler, C. V. (Dept. Clinical Physiology, Serafimer Hosp., Stockholm, Sweden). *Gut* 16(6):482-489, 1975.

The respective contributions of the smooth internal sphincter and the striated sphincter muscles to anal pressure were mapped with the anal canal at rest, after an abrupt distension of the rectum with an air balloon, and during constant distension. Ten healthy subjects (3 women and 7 men, mean age 20 yr) were examined before and after the striated muscles had been completely paralyzed by bilateral pudendal block, making it possible to record the activity from the internal sphincter alone. The right leg of each subject was grounded *via* a plate electrode attached to the skin, and recordings were made from a concentric needle electrode inserted into the external sphincter and from a similar electrode inserted into the puborectalis muscle. Maximal anal pressure was significantly reduced after pudendal block, from a mean of 64 mm of Hg to 54 mm of Hg, indicating that the internal sphincter contributed about 85% of the anal pressure at rest. During rectal filling, the internal sphincter was observed to relax, the relaxation being preceded in some cases by a brief increase in anal pressure and a burst of EMG activity from the striated muscles. The relaxation of anal pressure during rectal filling was greater after than before pudendal block; the anal pressure at maximal relaxation after pudendal block stabilized around 12 mm of Hg when the rectum was substantially distended. This pressure came entirely from the internal sphincter plus any effect of purely mechanical factors in the anal canal. Thus the activity of striated muscle accounted for the loss of pressure compared with that (35 mm Hg) before the block. The internal sphincter contributed about 40% of the pressure in the anal canal after sudden substantial distension of the rectum, but accounted for about 65% of the pressure during constant substantial rectal distension. It is concluded that the internal sphincter in the adult is chiefly responsible for anal continence at rest. In the event of sudden substantial distension of the rectum, continence is maintained by the striated sphincter muscles, whereas both sphincter systems probably have an important function during constant distension.

8099 ANALYSES OF SMALL BOWEL PROPULSION, ILEOCAECAL PASSAGE AND SERUM GASTRIN AFTER TRUNCAL VAGOTOMY. A METHODOLOGICAL STUDY IN THE RAT WITH CONTINUOUS INTRADUODENAL INFUSION. *(E.)* Lundqvist, H.; Jung, B.; Gustavsson, S.; Nilsson, F.; Lundqvist, G. (Dep. Phys. Biol., Gustaf Werner Inst., Uppsala, Sweden). *Acta Chir. Scand.* 141(4):298-303, 1975.

The effect of truncal vagotomy and pyloroplasty on the propagation of ${}^{51}CrO_4{}^{2-}$, infused slowly into the duodenum together with a standardized test meal, was studied in fasted male Sprague-Dawley rats. In both vagotomized and control rats, the test solution was infused at a rate of 3.3 µl/min for 5 hr into a tube which had been introduced into the duodenum by duodenotomy. The animals were then killed and the radioactivity in the stomach, small intestine, cecum, and colon was counted with a slit-collimated gamma detector. A mean of about 60% of the total activity in the small intestine was found in large peaks which contained more than 25% of the small intestine activity. These large peaks increased in number towards the distal part of the small intestine and about 61% of the length of the small intestine was virtually free of activity. Small peaks of activity were evenly distributed along the entire length of the small intestine. The vagotomized animals and controls did not differ significantly in terms of peak distribution. The fractional amount of activity in the cecum and colon was also the same in vagotomized and control rats, and the mean transport time between duodenum and cecum was the same. The mean propagation velocity in the first 10% of the small intestine was slow; it was high and constant in the next 30% and then decreased toward the cecum. Again, there were no significant differences between controls and vagotomized animals. The passage from ileum to cecum in the vagotomized rats indicated a uniform process, each discharge containing about 11% of the total administered activity; this implied 2 discharges/hr. Vagotomy resulted in a significant elevation in the serum gastrin level. The results suggest a change in the functional conditions within the ileocecal region after vagotomy. They do not support the hypothesis of incontinence of the ileo-cecal valve after vagotomy.

8100 THE RELATIONSHIP BETWEEN GASTRIC EMPTYING RATE AND PLASMA ENTEROGLUCAGON CONCENTRATION [abstract]. *(E.)* Ralphs, D. N. L.; Bloom, S. R.; Lawson Smith, C.; Thomson, J. P. S. (Middlesex Hosp., London, England). *Gut* 16(5):406, 1975.

8101 THE MECHANISM OF ACTION OF METOCLOPRAMIDE [abstract]. *(E.)* Hay, A. M. (R. Postgrad. Med. Sch., London, England). *Gut* 16(5):403, 1975.

8102 A NEURAL-MEDIATED MYOELECTRIC AND CONTRACTILE RESPONSE TO CHOLERA TOXIN [abstract]. *(E.)* Bertiger, G. (Hosp. of Univ. Pennsylvania, Philadelphia, Pa.). *Gastroenterology* 68(4):1088, 1975.

8103 CANINE TRICHINOSIS: A MODEL TO STUDY CHANGES IN INTESTINAL MOTILITY CAUSED BY ENTERIC PATHOGENS [abstract]. *(E.)* Schanbacher, L. M.; Weisbrodt, N. W.; Castro, G. A. (Univ. Texas Med. Sch., Houston, Tex.). *Gastroenterology* 68(4):981, 1975.

8104 ORGANIZATION OF VAGAL FIBERS TO CONTROL GASTRIC MOTILITY [abstract]. *(E.)* Daniel, E. E.; Sarna, S. K. (Dept. Pharmacol., Univ. Alta., Canada). *Gastroenterology* 68(4):879, 1975.

8105 EFFECT OF THE 1ST 5 CM OF DOUDENUM ON GASTRIC EMPTYING: STUDIES OF ACID, FAT, GLUCOSE AND SYMPATHETIC BLOCKADE [abstract]. *(E.)* Cooke, A. R.; Clark, E. D. (VA Hosp., Iowa City, Iowa). *Gastroenterology* 68(4):877, 1975.

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8107 INFLUENCE OF EXTRINSIC FORCES ON INTRALUMINAL LOWER ESOPHAGEAL SPHINCTER PRESSURE [abstract]. *(E.)* Dodds, W. J.; Miller, W. N.; Hogan, W. J.; Arndorfer, R. C.; Lydon, S. B.; Stef, J. J. (Med. Coll. Wisconsin, Milwaukee, Wis.). *Gastroenterology* 68(4):885, 1975.

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8110 STUDY ON THE EFFICIENCY OF ELECTRIC STIMULATION ON THE PELVIC FLOOR. *(Fr.)* Rottembourg, J. L.; Ghoneim, M. A.; Fretin, J.; Susset, J. G. (Centre Hospitalier Universitaire de Sherbrooke, P. Q., Canada). *Biol. Gastroenterol. (Paris)* 8(1):63-72, 1975.

8111 SPONTANEOUS ACTIVITY OF NEURONS IN MYENTERIC PLEXUS OF THE INTESTINE INTACT SEGMENTS IN RABBITS. *(Rus.)* Nozdratchev, A. D.; Katchalov, U. P.; Gnetov, A. V. (Lab. Physiology Vegetative Nervous System, I. P. Pavlov Inst. Physiology, Leningrad, USSR). *Fiziol. Zh.* 61(5):725-730, 1975.

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8114 EFFECTS OF GLUCAGON (G) AND SECRETIN (S) ON FOOD OR MORPHINE-INDUCED MOTOR ACTIVITY OF THE DISTAL COLON, RECTUM AND ANAL SPHINCTER [abstract]. *(E.)* Chowdhury, A. R.; Lorber, S. H. (Div. Gastroenterol., Temple Univ., Philadelphia, Pa.). *Clin. Res.* 23(3):247A, 1975.

8115 NATURE OF THE VAGAL INHIBITORY INNERVATION TO THE LOWER ESOPHAGEAL SPHINCTER [abstract]. *(E.)* Goyal, R. K.; Rattan, S. (Univ. Texas Health Sci. Cent., Dallas, Tex.). *Clin. Res.* 23(3):249A, 1975.

8116 DIFFERENTIAL MYOELECTRIC AND MOTOR RESPONSES OF THE HUMAN COLON TO NEUROHUMORAL AGENTS [abstract]. *(E.)* Sanpe, W. J.; Carlson, G. M.; Cohen, S. (Univ. Pennsylvania Hosp., Philadelphia, Pa.). *Clin. Res.* 23(3):257A, 1975.

8117 EVIDENCE FOR THE DIRECT INHIBITORY EFFECT OF METHYL METHACRYLATE VAPOR ON GASTROINTESTINAL SMOOTH MUSCLE [abstract]. *(E.)* Tansy, M. F.; Martin, J. S.; Behaim, S.; Landin, W. E. (Temple Univ. Health Sci. Cent., Philadelphia, Pa.). *Clin. Res.* 23 (3):258A, 1975.

8118 THE ADRENERGIC CONTROL OF THE INTERNAL ANAL SPHINCTER IN MAN [abstract]. *(E.)* Gutierrez, J. G.; Shah, A. N. (Genesee Hosp., Rochester, N. Y.). *Clin. Res.* 23(3):250A, 1975.

8119 THE EFFECT OF INTESTINAL WALL TEMPERATURE VARIATIONS ON THE DIGESTIVE MOTILITY IN THE NON-ANAESTHETIZED DOG. *(Fr.)* Santini, R.; Laugier, C.; Brard, E. (I.N.S.A., 20 Ave. A. Einstein, 69621 Villeurbanne, France). *C. R. Soc. Biol. (Paris)* 169 (2):338-344, 1975.

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8121 GASTRIC AND COLONIC MOTILITY DURING EXPERIMENTAL CONFLICTS IN PSYCHOSOMATIC PATIENTS. *(It.)* Trombini, G.; Lanfranchi, G. A. (Ist.di Psicologia e Clinica Med. II, dell' Universita di Bologna, Italy). *Med. Psicosomatica* 19(2): 151-172, 1974.

8122 INFLUENCE OF SULFHYDRYL REAGENTS AND COMPOUNDS ON THE CONTRACTILE RESPONSE TO ACETYLCHOLINE IN ISOLATED RAT SMALL INTESTINE. *(E.)* Takasaki, K.; Kiramine, Y. (Daiichi Coll. Pharmaceutical Sciences, Fukuoka, Japan). *Kurume Med. J.* 21(4):91-100, 1974.

8123 INFLUENCE OF TETRODOTOXIN ON THE CONTRACTILE RESPONSE OF THE SMALL INTESTINE OF GUINEA-PIG PRODUCED BY PICRIC ACID AND ACETYLCHOLINE. *(E.)* Takasaki, K.; Ogata, H. (Daiichi Coll. Pharmaceutical Sciences, Fukuoka, Japan). *Kurume Med. J.* 21(4): 101-109, 1974.

8124 INVESTIGATION OF CHANGES IN THE INTRAGASTRIC PRESSURE BY MEANS OF A SEMICONDUCTOR TENSOMETRIC MEMBRANE. *(Cz.)* Enderle, E.; Pallova, S. (Interni katedra ILF, Praha 4, Budejovicka 800, Czechoslovakia). *Cesk. Gastroenterol. Vyz.* 29(3):195-198, 1975.

8125 EFFECT OF SULPIRIDE ON INTESTINAL MOTILITY. *(It.)* Marone, G.; Lobello, R.; Marzano, L. A.; Colantuoni, A. (Seconda Facolta Medicina Chirurgia, Universita Napoli, Italy). *Boll. Soc. Ital. Sper.* 50(23):2074-2079, 1974.

8126 STUDIES ON PHOSPHOLIPIDS IN SMALL INTESTINAL SMOOTH MUSCLE. I. ON COMPOSITION AND METABOLISM OF PHOSPHOLIPIDS IN SUBCELLULAR FRACTIONS FROM RAT SMALL INTESTINAL SMOOTH MUSCLE. *(Jpn.)* Minakawa, K. (Dept. Surgery, Section 1, Sapporo Medical College). *Sapporo Igaku Zasshi* 43(2):87-89, 1974.

8127 STUDIES ON PHOSPHOLIPIDS IN SMALL INTESTINAL SMOOTH MUSCLE. II. ON EXCHANGE OF PHOSPHOLIPIDS BETWEEN MITOCHONDRIA AND MICROSOMES IN RAT SMALL INTESTINAL SMOOTH MUSCLE. *(Jpn.)* Minakawa, K. (Dept. Surgery, Section 1, Sapporo Medical College). *Sapporo Igaku Zasshi* 43(2):98-103, 1974.

8128 BIOPOTENTIALS OF THE SMOOTH MUSCLES AND CONTRACTILE ACTIVITY OF THE DUODENUM. *(Rus.)* Ustinov, V. N. (I. P. Pavlov Inst. Physiology, Leningrad, USSR). *Fiziol. Zh. SSSR* 61(7):1060-1068, 1975.

See also, 8192, 8435, 9352.

SECRETION AND METABOLISM

8129 STUDIES OF INTESTINAL LYMPHOID TISSUE. II. ASPECTS OF PROLIFERATION AND MIGRATION OF EPITHELIAL LYMPHOCYTES IN THE SMALL INTESTINE OF MICE. *(E.)* Marsh, M. N. (Southampton Univ. Sch. Med., England). *Gut* 16(9):674-682, 1975.

The proliferation and migration of epithelial lymphocytes in the adult mouse jejunum were studied in animals of the Charles River strain. Some animals were given 6 consecutive i.p. injections of ^{3}H-methyl-thymidine (^{3}H-Tdr, 25 μCi) at hourly intervals, and killed 6-168 hr after the first injection. Other animals received 1-4 i.p. injections of demecolcine (250 μg) and were killed 1 hr after the last injection. Segments of upper jejunum from both groups were fixed with chrome-osmium, embedded in Epon, and examined as in abstract 8003 in this issue. Label was confined predominantly to the medium-sized epithelial lymphocytes, and virtually all of the labeled lymphocytes observed in transit across the basement membrane were of the same variety. Spontaneous mitotic figures in the epithelial lymphocytes were observed in about 1-2/1000 epithelial cell nuclei. The density of immunoblasts (labeled and unlabeled) was on the order 3/1000 nuclei. ^{3}H-Tdr treatment was followed by 2 peaks of labeling occurring between 6 and 60 hr and between 72 and 168 hr. The maxima occurred at 24 hr and 144 hr, with the proportion of labeled lymphocytes at these times being approximately 25% and 35%, resp. Between 60 and 96 hr there was a rapid decrease in the total population of epithelial lymphocytes, the rate of fall being about 3 cells/1000 epithelial cell nuclei/hr. The epithelial cells did not migrate along the villi but circulated rapidly through the epithelium. Within the mucosal lymphatics, 74.4% of the lymphocytes were small (less than 7 μm in diameter), 19.3% were medium-sized (7-10 μm in diameter), and 6.3% were large (greater than 10 μm in diameter. In contrast, 25% of the medium-sized lymphocytes and 38% of the large cells were labeled, compared with only 3.5% of the small lymphocytes. These lymphocytes also exhibited a biphasic pattern of labeling, with a decrease in number occurring between 48 and 80 hr. After demecolcine treatment, epithelial lymphocyte mitosis occurred at a rate of about 1/100 lymphocytes/hr. The overall lymphoid cell population per villus was about 840, with about 9 of these epithelial lymphocytes dividing hourly. Consequently, epithelial lymphocytes must leave the epithelium at a similar rate, or their density within the villous epithelium would increase progressively. These results suggest that the epithelial lymphocytes may directly enter the adjacent lymphatics, thereby gaining access to the thoracic duct lymph.

8130 EFFECT OF MICROFLORA ON THE FREE AMINO ACID DISTRIBUTION IN VARIOUS REGIONS OF THE MOUSE GASTROINTESTINAL TRACT. *(E.)* Whitt, D. D.; Demoss, R. D. (Dept. Microbiology, Univ. Illinois, Urbana, Ill. 61801). *Appl. Microbiol.* 30(4):609-615, 1975.

The distribution of free amino acids in various regions of the gastrointestinal tract (stomach, upper small intestine, lower small intestine, cecum, upper colon, and lower colon) was studied in germfree and conventionalized Charles River mice. Particular emphasis was placed on the conversion of tryptophan to indole as a probe for studying intermicrobial and microbe-host interactions *in vivo*. Large differences were observed in the free amino acid content of the various regions of the digestive tract in each type of mouse and also in any one region between germfree and conventionalized mice. Concentrations of arginine, threonine, serine, glutathione, tyrosine and tryptophan were higher in the germfree mice. Free amino acid concentrations in the upper half of the small intestine were similar in both types of mice and were much greater than in the stomach. A pronounced effect of microflora on free amino acid composition was first observed in the lower small intestine. While the concentrations of free amino acids in the lower small intestine of the conventionalized mice were the same as in the upper small intestine, the concentrations in the lower small intestine of the germfree mice were three-fold lower than in the upper small intestine. Overall, free amino acid concentrations in the cecum and colon were similar and were essentially the same in both types of mice. However, significant amounts of indole were found in the cecum and upper and lower colon of conventionalized mice. The data indicate that the changes in free amino acid content and distribution produced by microflora are great enough to serve as a probe for studying the interactions of a limited number of species of microbes in gnotobiotic animals and to assign probable specific functions to each species. The results also demonstrate the feasibility of using the metabolic conversion of tryptophan as a probe for studying microbial interactions and microbe-host interactions.

8131 COMPARISON OF THE ADAPTIVE CHANGES IN DISACCHARIDASE, GLYCOLYTIC ENZYME AND FRUCTOSEDIPHOSPHATASE ACTIVITIES AFTER INTRAVENOUS AND ORAL GLUCOSE IN NORMAL MEN. *(E.)* Greene, H. L.; Stifel, F. B.; Hagler, L.; Herman, R. H. (Vanderbilt

Univ. Sch. Medicine, Nashville, Tennessee 37232). *Am. J. Clin. Nutr.* 28(10):1122-1125, 1975.

This study compared the adaptive changes in disaccharidase, glycolytic enzyme and fructosediphosphatase activities after p.o. and i.v. administration of glucose in human volunteers. Seven healthy adult men (aged 18-24 yr) were fed a 3,000 kcal defined liquid formula diet daily for 19 days. Except for one five-day period, 50% of the total caloric intake was provided as either p.o. or i.v. glucose. The study was divided into four periods as follows: period 1 lasted five days and provided 50% of calories as glucose; period 2 lasted five days and provided no carbohydrate (70% fat and 30% protein); period 3 lasted four days and provided 50% of calories as i.v. glucose and 50% of calories as p.o. fat plus protein; period 4 lasted five days and provided 50% of calories as p.o. glucose. Intestinal biopsy specimens were taken on the third and fifth days of periods 1, 2, and 4, and on the fourth day of period 3. All biopsies were performed with the adult Crosby-Kugler intestinal biopsy capsule. Histologic examination by light microscopy and enzyme measurements were done on each biopsy specimen. No change in intestinal morphology occurred during the study. The carbohydrate-free diet caused the alpha-glucosidase (maltase and sucrase) activities to decrease significantly from that seen with the glucose diet. Sucrase decreased from approximately 14.4 to 7.1 μM/min/g tissue and maltase decreased from approximately 56.1 to 30.0 μM/min/g tissue. Glycolytic enzyme activities decreased during the carbohydrate-free period: pyruvate kinase from approximately 236 to 78 μM/min/g protein; fructose 1-phosphate aldolase from 147 to 53 μM/min/g protein; fructose-1,6-diphosphate aldolase from 151 to 55 μM/min/g protein; and hexokinase from 21 to 7 μM/min/g protein. I.v. glucose caused no change in disaccharidase activities. The enzyme activities during periods 1 and 4 were identical and significantly higher than during period 2 with the exception of fructose-1,6-diphosphatase, which increased during period 2 as compared with periods 1 and 4. These findings provide an explanation for the transient period of decreased tolerance to dietary sugars when patients are weaned from total parenteral feedings to enteral feedings.

8132 SEX DIFFERENCES IN ANTRAL AND SERUM GASTRIN CONCENTRATION IN THE RAT [abstract]. *(E.)* Lichtenberger, L. M.; Nance, D. M.; Gorski, R. A. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterology* 68(4):935, 1975.

8133 DISAPPEARANCE HALF-TIME OF EXOGENOUS CHOLECYSTOKININ FROM CIRCULATION IN MAN AND DOGS [abstract]. *(E.)* Rayford, P. L.; Fender, H. R.; Ramus, N. I.; Thompson, J. C. (Univ. Texas Med. Branch, Galveston, Tex.). *Gastroenterology* 68(4):971, 1975.

8134 ROLE OF PITUITOADRENAL FUNCTION IN THE REGULATION OF SERUM GASTRIN LEVELS IN RATS [abstract]. *(E.)* Tateishi, H.; Onishi, T.; Nomiyama, S.; Nakao, E.; Majima, S. (Kyoto Prefectural Univ. Med., Kyoto, Japan). *Gastroenterology* 68(4): 996, 1975.

8135 BIOCHEMICAL ACTIVITY OF TRYPSIN COMPLEXED WITH ANTIBODY [abstract]. *(E.)* Rinderknecht, H.; Carmack, C.; Geokas, M. C. (Sepulveda VA Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):899, 1975.

8136 METIAMIDE AND PROSTAGLANDIN E_1 INHIBITION OF PENTAGASTRIN STIMULATED ACID SECRETION [abstract]. *(E.)* Charters, A. C.; Brown, B. N.; Orloff, M. J. (Dept. Surg., Univ. California, San Diego, La Jolla, Calif.). *Gastroenterology* 68(4): 872, 1975.

SECRETION AND METABOLISM

Stomach

8137 SOMATOSTATIN: ABUNDANCE OF IMMUNOREACTIVE HORMONE IN RAT STOMACH AND PANCREAS. *(E.)* Arimura, A.; Sato, H.; Dupont, A.; Nishi, N.; Schally, A. V. (Tulane Univ. Sch. Medicine, New Orleans, La. 70112). *Science* 189(4207):1007-1009, 1975.

An antiserum to synthetic somatostatin was prepared and a radioimmunoassay system, which allows displacement of (^{125}I-Tyr)somatostatin by unlabeled hormone, was utilized to study concentrations of the hormone in various adult female rat organs (Charles River, DC strain). Heart, liver, lungs, thymus, spleen, kidneys, adrenals and ovaries had no significant levels, while pancreas (33.8 pg/μg of protein) and stomach (11.7 pg/μg of protein) had levels such that total amount in either organ was greater than that in the hypothalamus. Purification on a Sephadex G-25 column and elution with 0.2 N acetic acid allowed two immunoreactive peaks to be identified. Pancreatic extract, as well as that from stomach, contained both peaks, but that associated with big somatostatin predominated in pancreas and that associated with small somatostatin predominated in the stomach. This study suggests that the pancreas and the stomach may synthesize somatostatin, or an immunoreactively similar hormone, which might play a role in the secretory activities of these organs.

8138 HUMAN GASTRIC MUCOSAL ZYMOGEN GRANULES.

(E.) Mangla, J. C.; Lillibridge, C. B.; Navab, F.; Turner, M. D. (Monroe Community Hosp., Rochester, N.Y.). *Biochem. Med.* 13(2):184-191, 1975.

The proteinase composition of zymogen granules isolated from the fundic glands of human gastric mucosa was examined with electrophoretic techniques. The tissue was obtained from a patient undergoing resection for duodenal ulcer, and additional gastric and esophageal biopsies were obtained from a patient with reflux esophagitis. The tissues were also examined histopathologically. The gastric tissue from the first patient was homogenized and separated by differential centrifugation into 6 fractions: nuclei and cell debris (B); supernatant (C); zymogen granules (D); supernatant (E); 'mitochondria' (F); and supernatant (G). Although all fractions contained some activity, proteolytic activity was highest in the zymogen granule fraction D. The presence of some activity in fractions E, F, and G may be due to breakage of zymogen granules. Agar gel electrophoresis showed that cathepsin was present in fractions B, E, and G, but not in fraction D. The esophageal biopsy specimens contained only cathepsin bands on agar gel electrophoresis, while the gastric biopsy specimens contained all gastric mucosal proteases. The data indicate that cathepsin does not originate in chief cells containing zymogen granules; it may be associated with or a product of the mucus cell.

8139 CHARACTERISTICS OF GASTRIC INHIBITION BY ACIDIFICATION OF OXYNTIC GLAND AREA. *(E.)*

Konturek, S. J.; Obtulowicz, W.; Tasler, J. (Medical Acad., Cracow, Poland). *J. Physiol.* 251(3):699-709, 1975.

The nature of the fundic feedback inhibition of acid secretion in response to a peptone (liver) meal and to i.v. histamine (160 µg/kg/hr), pentagastrin (8 µg/kg/hr) and Urecholine (100 µg/kg/hr) was studied in dogs with Heidenhain pouches, gastric fistulas, and pancreatic fistulas. The liver meal (pH 5.0-1.0) was introduced into the Heidenhain pouch; in some cases, the pouch was irrigated with 2% xylocaine solution (50 ml) or 2% atropine solution (50 ml) prior to the introduction of the test meal, or atropine (100 µg/kg/hr), metiamide (2.9 mg/kg/hr), or secretin (4 µg/kg/hr) was injected i.v. prior to the introduction of the meal. The gastric acid secretion responses were measured using the intragastric titration method and by monitoring the rate at which a solution of 1.0 N NaOH had to be added to maintain the pH of the gastric contents at a predetermined value. At pH 5.0, the liver extract meal produced a potent and pressure-related stimulation of acid secretion from the Heidenhain pouch without any change in secretion from the main stomach and pancreas or in the serum immunoassayable gastric concentration. Reduction of the pH below 5.0 resulted in a pH-dependent inhibition of gastric acid output, which at pH 1.0 was only about 30% of the value at pH 5.0. Acid secretion from the pouch induced by histamine, pentagastrin, and Urecholine also showed a gradual decrease when the pH of the pouch contents was decreased from 5.0 to 1.0. This pH-dependent inhibition was accompanied by an increase in pepsin secretion. The pH-dependent inhibition of the Heidenhain pouch response to the liver extract meal was not altered by topical xylocaine or atropine or by i.v. atropine, metiamide, or secretin, all of which caused a marked inhibition of the main stomach response to the liver meal. The results indicate that there is a local and gastrin-dependent inhibition mechanism of gastric acid secretion that is activated by an acidified meal making contact with the oxyntic gland area.

8140 RELEASE OF GASTRIN ON VAGAL STIMULATION IN THE CAT. *(E.)*

Uvnas, B.; Uvnas-Wallensten, K.; Nilsson, G. (Dept. Pharmacology, Karolinska Institutet, Stockholm, Sweden). *Acta Physiol. Scand.* 94:167-176, 1975.

An attempt was made to obtain quantitative information concerning gastrin output by simultaneously recording gastric blood flow and gastrin concentrations in the gastric and/or the peripheral venous blood. The experiments were performed on 30 cats (2-4 kg), fasted for 18 hr and anesthetized with chloralose-urethane (50 and 100 mg/kg, i.v.). Blood pressure was recorded in one of the femoral arteries. The intestine below the duodenum was removed. To allow sampling of antral gastrin, the portal vein was ligated close to its bifurcation (i.e., above the entrance of the antral venous blood) and a polyethylene catheter was inserted into the blind end of the superior mesenteric vein. During each experiment, the catheter was continuously perfused with warm water (38 C) and isotonic 0.15 M phosphate buffer solution (pH 7.4) at a rate of 5 ml/min. The cervical vagal nerves were ligated or cut and covered with paraffin oil or plastibase to prevent drying. The distal ends of the nerves were stimulated supramaximally with a Grass stimulator (S 88) delivering 7 V, of three to five min duration, and 1 to 20 Hz. The effects on heart rate and blood pressure following stimulation were taken as evidence of vagal activation. In certain experiments, gastric secretion was collected each 15 min. The continuous recording of gastric blood flow allowed quantitative calculations of the gastrin output to be made. Hematocrit values for blood from ten cats varied from 35 to 56 (average, 42.5). The basal gastrin output/min was calculated from three to five gastrin blood samples taken during 30 min and from the concomitant gastric blood flow. Basal peripheral gastrin levels averaged 65 pg/ml and basal portal levels 225 pg/ml. On unilateral vagal stimulation with frequencies above 3 to 4 Hz, gastrin release rapidly increased, reaching a peak within 5 to 10 min. In spite of continued stimulation and independent of frequency, the gastrin levels declined and returned to basal values after a total of 2 to 3,000 stimuli. A new maximal response could be induced after a recovery period of 15 to 30 min. In the same cat stimulation of either the left or the right vagus released equal maximal amounts of gastrin (average 32,000 pg). The maximal gastrin output on vagal stimulation corresponds to less than 1% of the total content of antral gastrin determined with radioimmunoassay. It is concluded that since the basal gastrin values fluctuate by about 30%, the technique presented in this paper will not allow one to record the low gastrin output which can be expected on unilateral vagal stimulation with frequencies below 4 Hz.

8141 GASTRIC ACID RESPONSES TO GRADED VAGAL STIMULATION IN THE ANAESTHETIZED CAT.

(E.) Sjodin, L. (Dept. Pharmacology, Karolinska Institutet, Stockholm, Sweden). *Digestion* 12(1): 17-24, 1975.

The relationship between stimulation frequency and acid response in 45 anesthetized cats with intact or resected gastrin-releasing regions was studied. The vagus was isolated in the neck and placed on bipolar silver electrodes connected to a monophasic square wave impulse generator with impulse strength of 4 V and duration of 5 msec. The stomach was cannulated and isolated through an abdominal incision, and acid output measured by titration to pH 7. In cats with intact antrum and duodenum, graded acid responses occurred with frequencies of 0.5-8 Hz, with maximal secretion at 4-8 Hz. Acid output in antrectomized cats was lower at all frequencies, but not significantly. Significantly lower acid outputs occurred at all frequencies in cats with resected antrum and duodenum. Antrectomized cats, infused i.v. with crude gastrin extracts (0.3-2.7 g wet hog antral mucosa/kg/hr) having no effect alone, responded to vagal stimulation of 1-4 Hz as did cats with intact antrum. Antrectomized cats receiving higher doses of gastrin (0.3-7.6 g wet mucosa/kg/hr) had greater responses to low frequency stimulation (0.5-1 Hz) than did cats with intact antrum. Thus, graded acid secretion occurs in response to increased stimulation frequency from 0.5-8 Hz with maximal response at 4-8 Hz. Antrectomy reduces acid response to low frequency stimulation, and duodenal resection causes a greater reduction.

8142 ROLE OF ANTRUM AND DUODENUM IN THE CONTROL OF POSTPRANDIAL GASTRIC ACID SECRETION AND PLASMA GASTRIN CONCENTRATION IN DOGS.

(E.) Sjödin, L.; Nilsson, G. (Dept. Pharmacology, Karolinska Institutet, S-104 01 Stockholm 60, Sweden). *Gastroenterology* 69(4):928-934, 1975.

Secretion of basal and postprandial gastrin and acid was studied in three mongrel dogs with vagally innervated fundic pouches (Pavlov type) preoperatively and after antrectomy with gastroduodenostomy, then after resection of the duodenal bulb with gastroduodenostomy. Basal pouch secretion was collected for four 15-min periods after an 18-hr fast. A 250 g minced boiled beef liver meal with 250 g water was fed the animals, then gastric secretions were collected for 3 hr, and five samples at 2 min intervals and two at 5 min intervals were collected from a leg vein for gastrin determinations. Histamine was infused i.v. as the dihydrochloride at 0.25 to 8 mg/hr to determine acid response after each operation. Basal levels of gastrin following antrectomy (65, 39, and 15 pg/ml) were essentially unchanged from preoperative levels (63, 46, and 21 pg/ml), while bulb resection reduced levels significantly (42, 24, and 3 pg/ml). Removal of the duodenal bulb resulted in no postprandial elevation of serum gastrin. Peak postprandial acid response was 59, 188 and 191% of maximal response to histamine. Following antrectomy, three-hr outputs were 147, 28 and 48% higher than pre-operative levels. Duodenal bulb resection reduced the postprandial acid secretion to or below preantrectomy values. This study shows that antrectomy does not significantly alter basal gastrin secretion, suggesting that there may be mechanisms regulating basal levels. Following duodenal bulb resection, basal levels were reduced, suggesting that this regulation is limited to the bulbar mucosa. This study also demonstrates an increase in gastric acid following antrectomy, supporting the concept that low levels of gastrin are sufficient to permit vagal stimulation of acid output, but it may also suggest that antrectomy eliminated an antral mechanism which limits postprandial acid secretion. Resection of the bulb reduced acid output, but only to preoperative levels, which suggests a possible acid secretion-inhibitory mechanism in the bulb as well as a stimulatory mechanism.

8143 TITRATION OF SODIUM CHANNELS IN CANINE GASTRIC MUCOSA.

(E.) Kauffman, G. L., Jr.; Thompson, M. R. (Dept. Physiology, Univ. Michigan, Ann Arbor, Mich. 48104). *Proc. Natl. Acad. Sci.* 72(9):3731-3734, 1975.

Net Na^+ flux from mucosa to lumen, potential difference, and volume and plasma protein output were measured in vagally denervated, separated pouches of the canine oxyntic or pyloric glandular mucosa when the pouches were irrigated with Na^+-free solutions whose pH ranged from 1.5 to 12.2. The apparent permeability to Na^+ (P'_{Na}) was then calculated. The P'_{Na} was lowest when the mucosa was bathed with acid and increased two- to three-fold when the pH was raised to 10. In the pH range 10.0 to 11.2, the P'_{Na} was greater by an order of magnitude, but the volume output was small and no plasma proteins were shed. When the pH was raised above 11.2, there was an abrupt increase in P'_{Na} and the mucosa shed a large volume of fluid containing plasma proteins. The change effected by raising the pH to 10.0 to 11.2 occurred within ten sec, and was reversible. The change effected by raising the pH above 11.2 also occurred within ten sec, but was only partially reversible. These data are consistent with the idea that the channels through which Na^+ diffuses from the gastric interstitial fluid into the lumen are dominated by ionizable groups having an apparent pK_a in the range 10.5 to 11.5.

8144 RADIOTELEMETRIC TITRATION OF GASTRIC JUICE AND ALCOHOL ABSORPTION. *(Ger.)* Weinel, H.; Wolters, P.; Kruse-Jarres, J. D. (78 Freiburg, Hugstetter Strasse 55, Germany). *Med. Klin.* 69(50): 2067-2070, 1974.

The relation between alcohol absorption and gastric secretion was studied in 11 normal subjects (6 males and 5 females) for 90 min after ingestion of 1.05 g/kg of alcohol over a period of 10 min or less. Blood alcohol concentrations were measured continuously in an Auto-Analyzer using alcohol dehydrogenase and a spectrophotometric method, and gastric juice was titrated in the stomach with 1 M potassium bicarbonate and the use of a radio transmitter placed in the stomach. Gastric acid was titrated under basal conditions and after maximal stimulation by i.v. infusion of 6 µg/kg/hr of pentagastrin. One subject who had pathologically high blood alcohol concentrations but who was asymptomatic was not included in the statistical analysis. A close inverse correlation was found between gastric acid secretion after maximal pentagastrin stimulation and the rate at which blood alcohol concentrations increased up to 45 min after ingestion of alcohol was begun. After 75 min the correlation was no longer significant since alcohol absorption was then affected more by processes occurring outside the stomach. These findings explain why alcohol absorption is decreased in hyperchlorhydria, increased in subjects with atrophic gastric mucosa, and increased in alcoholics if they have alcohol-induced atrophic gastritis. Reduced tolerance to alcohol following stress situations can be attributed to decreased gastric secretion following an initial increase during stress so that ingested alcohol is diluted less than normal and is more rapidly absorbed. Increased alcohol absorption in gastrectomized patients is due both to decreased gastric secretion and increases in the rate at which the stomach empties.

8145 DISTRIBUTION OF INTRAVENOUS SODIUM ACETYLSALICYLATE IN THE UNANAESTHETIZED RAT ON STIMULATION AND INHIBITION OF GASTRIC SECRETION. *(E.)* Frenning, B.; Flemstrom, G. (Dep. Med., Univ. Uppsala, Sweden). *Scand. J. Gastroenterol.* 10(5):465-469, 1975.

The effect of the rate of gastric acid secretion on the mucosal concentration of salicylate was studied in fasted male albino rats 1 hr after the i.v. injection of carboxyl-^{14}C acetylsalicylate (20 or 40 mg/kg). Histamine (50 mg/kg) or atropine (15 mg/kg) was injected s.c. to stimulate or inhibit gastric acid secretion. ^{14}C activity in specimens of gastric mucosa, liver, kidney, and muscle was determined by liquid scintillation counting. Histamine increased the acidity but did not affect the volume of gastric secretion from the stomachs of pylorus-ligated rats; atropine decreased both the volume and acidity of the secretion. Histamine, but not atropine, lowered the sodium ion concentration and raised the chloride ion concentration in the secretion. The concentration of salicylate 1 hr after injection of the labeled drug was lowest in the muscle and gastric mucosa and highest in the blood and kidneys. The distribution of salicylate in these tissues was not altered by histamine or atropine treatment, and the salicylate concentration was proportional to the amount of salicylate injected in all tissues examined. Thus, the secretory state of the gastric mucosa did not affect the concentration of salicylate in this tissue when the drug was administered i.v.

8146 POTENTIAL HISTAMINE H_2-RECEPTOR ANTAGONISTS. 2. N^{α}-GUANYLHISTAMINE. *(E.)* Durant, G. J.; Parsons, M. E.; Black, J. W. (Smith, Kline and French Ltd., Welwyn Garden City, Hertfordshire, England). *J. Med. Chem.* 18(8):830-833, 1975.

The present study is part of a program aimed at the discovery of compounds that could specifically antagonize certain pharmacological actions of histamine that are not blocked by conventional antihistaminic drugs, e.g., pyrilamine. Converting the side-chain amino group of histamine into a guanidine yielded the first histamine H_2-receptor antagonist, N^{α}-guanylhistamine. N^{α}-guanylhistamine, as its sulfate salt, was tested for interactions with histamine H_2-receptors *in vivo* on gastric acid secretion using the lumen-perfused stomach of the anesthetized rat preparation. Stimulant activity was found at doses in the range of 16 to 512 µM/kg, given by rapid i.v. injection. The maximal response obtained with guanylhistamine was between 50 and 60% of that obtainable with histamine. Agonist potency, which was assessed by comparison of the doses of N^{α}-guanylhistamine and histamine required to produce equal acid secretory responses, was found to be less than 0.5% of histamine (n = 9). Guanylhistamine is therefore a weak agonist on gastric acid secretion. To test for antagonist activity, N^{α}-guanylhistamine was injected i.v. after a plateau of secretion had been established to an i.v. infusion of histamine. When first tested, the rate of histamine influence used (0.05 µM/kg/min) produced a secretory response which was less than 50% of maximum and guanylhistamine caused either no effect or a slight further increase in acid secretion. However, when N^{α}-guanylhistamine was tested against a near-maximal secretory response to histamine (infusion rate 0.25 µM/kg/min), inhibition was detected at doses of 256 µM/kg and greater. The approximate i.v. ID_{50} (that is, the dose to produce 50% inhibition of near-maximal secretion) was calculated to be 800 µM/kg (n = 15). The compound was further investigated on isolated guinea pig atrium *in vitro*, where histamine causes an increased rate of beating by interaction with histamine H_2-receptors. Using cumulative dose-response curves, N^{α}-guanylhistamine was found to have agonist activity at high concentrations up to 5 µM, but only achieved 60 ± 5% (n = 7) of the maximal response obtainable with histamine and the dose-response curves were not parallel. This behavior is typical of a partial agonist and, because of nonparallelism, only an approximate activity relative to histamine of 0.7% could be estimated. Guanylhistamine was also tested for interactions with histamine H_1-receptors on the isolated guinea pig ileum. No agonist activity was detected at doses up to 1 µM (i.e., potency smaller than 0.01% histamine; n = 4). However, guanylhistamine had a weak antagonist action against histamine on the guinea pig ileum, giving a pA_2 value of approximately 3.8 (n = 5). It is concluded that although guanylhistamine behaves as a partial agonist at histamine H_2-receptors, the structure of this weakly active antagonist provides a vital lead for the design of highly active and clinically effective H_2-receptor antagonists.

8147 INFLUENCE OF ATROPINE, METIAMIDE AND VAGOTOMY ON cAMP OF RESTING AND STIMULATED GASTRIC MUCOSA. *(E.)* Ruoff, H. J.; Sewing, K. F. (Dept. Pharmacology, Univ. Tubingen, Tubingen, West Germany). *Eur. J. Pharmacol.* 32:227-232, 1975.

The effects of atropine, metiamide, and truncal vagotomy on the cyclic AMP (cAMP) levels of the gastric mucosa (resting or stimulated) was studied in normal Wistar rats. To stimulate the mucosa, rats were pretreated with histamine, pentagastrin, carbachol or insulin. In vagotomized rats, gastric mucosa levels were investigated under basal conditions and after insulin. Gastric mucosal cAMP was determined by a protein binding assay. To test the influence of atropine (1 mg/kg) or metiamide (3 mg/kg) on resting and stimulated gastric mucosa, four combinations were necessary: saline-saline, inhibitor-saline, saline-stimulant, and inhibitor-stimulant. The rats were killed at the time of maximum cAMP concentration: 30 to 45 min after histamine, 45 min after pentagastrin, and 15 and 90 min after carbachol or insulin. Tests for cAMP were begun four to 20 weeks after truncal vagotomy. In rats treated with atropine, the mean gastric mucosal cAMP level ranged from 0.56 to 0.79 pM cAMP/mg wet weight and from 0.60 to 0.71 pM in the saline-treated animals. Atropine had no significant influence on the cAMP concentration of resting gastric mucosa. Gastric mucosal cAMP levels were significantly raised by histamine, pentagastrin, carbachol and insulin when compared with the saline-treated control groups. Atropine was unable to prevent the gastric mucosal cAMP peaks caused by these four gastric secretagogues. The mean cAMP values of the six saline-treated control groups ranged from 0.66 to 0.76 pM/mg. No effect of metiamide on cAMP levels of the resting mucosa was observed in any of the six groups. All stimulants produced a significant increase in cAMP concentration. The only exception was at 90 min after carbachol when the cAMP level was not statistically significant from that of the controls. In contrast to atropine, metiamide blocked the histamine- and pentagastrin-mediated cAMP rise completely. No inhibiting effect of metiamide was found when carbachol or insulin were used as stimulants. Neither of the two consecutive cAMP peaks of the stimulants were influenced by metiamide. Gastric mucosal cAMP levels of vagotomized rats were significantly elevated four and 20 weeks after the operation in comparison to sham-operated animals. Insulin stimulation, which normally raised gastric mucosal cAMP levels, failed to do so in vagotomized animals. It was concluded that reduction of gastric secretion is not necessarily associated with a suppression of the gastric mucosal rise and that the *in vivo* rise of gastric mucosal cAMP after carbachol or insulin was not due to direct cholinergic action. From the spectrum of metiamide inhibitory actions, it was suggested that the increased gastric mucosal cAMP concentration after histamine and pentagastrin administration is mediated by H_2-receptor stiumlation.

8148 INHIBITORY ACTION OF METIAMIDE ON GASTRIC SECRETION INDUCED BY BOMBESIN AND CAERULEIN. *(E.)* Bertaccini, G.; Impicciatore, M.; Chiavarini, M. (Inst. Pharmacology, Univ. Parma, Parma, Italy). *Farmaco Ed. Sci.* 30(6):498-504, 1975.

Metiamide, the prototype of a new class of histamine H_2-receptor antagonists, was studied to determine if it could counteract the stimulant effect of bombesin, a tetradecapeptide, and hence, that of endogenous gastrin. Experiments were carried out on six mongrel dogs with gastric fistulas and Heidenhain pouches drained to the surface by metal cannulas, and on four cats with gastric fistulas only. They were administered bombesin (doses varied between 0.065 to 2 μg/kg/hr) by i.v. infusion, and metiamide either by single i.v. injection at the time of maximum hypersecretion or by continuous infusion starting together with that of the bombesin. Doses of metiamide varied from 1 to 10 mg/kg. The animals treated with bombesin alone acted as controls. In some experiments, atropine (0.2 mg/kg, s.c.) was given instead of metiamide. Gastric juice was collected from the Heidenhain pouch and the gastric fistula by gravity drainage and was separated into 15 min or 30 min samples. Gastric hypersecretion was evoked by continuous i.v. infusion of cerulein (2 μg/kg/hr). Metiamide was administered by a single i.v. injection (5 mg/kg), after 30 to 60 min of infusion, when a plateau was reached which exceeded the basal levels of secretion by 200 to 250%. In the dog, metiamide administered together with bombesin strongly inhibited the hypersecretion induced by the peptide at doses of 2.5 mg/kg. The inhibition was of noncompetitive type and the maximal effect of bombesin, observed after infusion of 1 μg/kg/hr, was reduced by approximately 75%. When metiamide was injected at the time of maximum hypersecretion induced by bombesin (1 μg/kg/hr), it provoked good inhibition at doses of 1 and 2.5 mg/kg and an almost complete block with return to pre-infusion (i.e. basal) levels, at the dose of 5 mg/kg. The degree of inhibition was approximately the same for the acid secretion from both the main stomach and the Heidenhain pouch. The rise in plasma levels of radioimmunological gastrin induced by bombesin was not modified by administration of metiamide. Atropine was also ineffective in modifying plasma levels of gastrin. The inhibitory effect of metiamide on the hypersecretion induced by bombesin paralleled that observed in the dog. There was only a small quantitative difference inasmuch as the virtual block of gastric secretion was induced by 10 mg/kg and not by 5 mg/kg as observed in the dog. The effect of metiamide in rats was rather erratic, but in the bulk of the experiments metiamide caused a 30 to 50% reduction of the acid secretion. The authors conclude that clinical trials would be necessary to check the possibility of the practical use of metiamide in diseases connected with gastric hypersecretion.

8149 DISPLACEMENT BY METIAMIDE OF THE DOSE-RESPONSE CURVES TO PENTAGASTRIN AND METHACHOLINE IN THE CONSCIOUS RAT. *(E.)* Lundell, L. (Inst. Physiol., Univ. Lund, Sweden). *Br. J. Pharmacol.* 54:507-509, 1975.

The effects of a specific histamine H_2-receptor antagonist, metiamide (50 or 500 µg/hr, infused i.v.), on the acid dose-response curves for pentagastrin (0-64 µg/hr, infused i.v.), and methacholine (0-128 µg/hr, infused i.v.) were studied in fasted female Sprague-Dawley rats with Heidenhain pouches. Metiamide infusion was begun 1 hr before pentagastrin or methacholine infusion, the latter drugs being infused for 90 min in stepwise increasing dosages. Gastric juice was collected in 30-min samples. The mean basal interdigestive secretion was 2.4 µEq/30 min. Increasing doses of pentagastrin produced graded secretory responses with a maximum of 119.3 µEq/hr at a pentagastrin dose of 32 µg/hr. The theoretical maximal response for pentagastrin, obtained by application of Michaelis-Menten equations to the observed responses, was 118.7 µEq/30 min. Metiamide (500 µg/hr) reduced the observed and calculated maximal response to pentagastrin to 64.1 and 66.4 µEq/30 min, resp. The secretory response to methacholine increased with increasing dosages; since doses higher than 128 µg/hr were followed by adverse side effects, maximal responses to this drug were not obtained. The median effective dose (ED_{50}) and calculated maximal response for methacholine were 24.1 and 175.8 µEq/30 min, resp. Metiamide did not alter the calculated maximal response, but 50 µg/hr metiamide inhibited the secretory response to lower doses (2-8 µg/hr) of methacholine and 500 µg/hr metiamide increased the ED_{50} to 90.8 µg/hr. The results are compatible with the hypothesis that pentagastrin is not a direct stimulant of the parietal cell but depends on an intermediary mechanism, i.e., the mobilization of histamine. No evidence was found that methacholine activates the H_2-receptor on the parietal cell. However, methacholine did block the action of histamine mobilized during the interdigestive state, thus interrupting the facilitating relation between small amounts of histamine and methacholine. The failure of metiamide to reduce the calculated maximal response to methacholine may be due to increased release of antral gastrin and subsequent mobilization of mucosal histamine.

8150 EFFECT OF PENTAGASTRIN ON SMALL BOWEL STRUCTURE AND FUNCTION IN THE RAT. *(E.)* Mayston, P. D.; Barrowman, J. A.; Dowling, R. H. (London Hosp. Medical Coll., London, England). *Digestion* 12(2):78-84, 1975.

The effects of chronic pentagastrin administration (2 mg/100 g/day for 15 days) on the structure and function of the duodenum and jejunum were studied in nine adult Wistar rats, while nine other rats receiving saline injections served as control. A one cm duodenal segment distal to the ampulla of Vater was excised for histological examination, and the distal 20 to 25 cm was cannulated for an *in vivo* recirculation-perfusion technique to evaluate glucose absorption. The mean wet weight of the proximal duodenum was 308 mg in treated rats and 231 mg in controls. No significant differences were noted in the weight of distal duodenum and proximal jejunum, in villus height and mucosal thickness, nor were there significant differences in glucose absorption. This suggests that chronic pentagastrin administration has a trophic effect limited to the proximal duodenum in the doses utilized in this study.

8151 EFFECTS OF AN ORALLY ADMINISTERED PROSTAGLANDIN ANALOGUE (16,16-DIMETHYL PROSTAGLANDIN E_2) ON HUMAN GASTRIC SECRETION. *(E.)* Wilson, D. E.; Winnan, G.; Quertermus, J.; Tao, P. (Abraham Lincoln Sch. Medicine, Univ. Illinois, P. O. Box 6998, Chicago, Ill. 60680). *Gastroenterology* 69(3):607-611, 1975.

The effects of p.o. administration of 16,16-dimethyl prostaglandin E_2 (DMPG) as the free acid on basal and histamine-stimulated gastric secretion in six healthy male volunteers (mean age 25.5 yr) are presented. Thirty-five studies were performed in which subjects were given one of four dosages of DMPG (0.75, 1.0, 1.25, 1.5 µg/kg) or placebo during histamine stimulation of gastric secretion and DMPG (1.5 µg/kg) or placebo during studies on basal secretion. Basal volume and acid output were 45 and 2.6 mEq/30 min, resp., and increased during submaximal stimulation with histamine to 93 and 13 mEq/30 min, resp. Thirty min after the instillation of DMPG (in 50 ml of water containing 1.0% polyethylene glycol), 76% of the amount administered had passed into the small intestine. A dose-response effect was noted in the inhibitory effect of DMPG; however, DMPG at 1.25 µg/kg had an inhibitory effect similar to that of the highest dose, whereas 1.0 µg/kg gave results similar to the lowest dose. DMPG (1.5 µg/kg) significantly inhibited gastric acid secretion for the entire two-hr study period, whereas the lowest dose inhibited acid secretion for 1.5 hr. The maximal inhibition always occurred during the first 30 min after administration (94% for DMPG at 1.5 µg/kg). Basal pepsin output was 34 ± 7 mg/30 min, increasing to 74 ± 13 mg/30 min during histamine stimulation. The highest dosages of DMPG caused significant declines in pepsin output. No subjects developed side effects attributable to DMPG. No changes in blood hematology, chemistry or urinalyses occurred. These studies indicate that when PGE_2 is administered p.o. as the free acid, it is a potent inhibitor of histamine-stimulated acid secretion in man at dosage levels that are free from side effects. It is suggested that prostaglandin analogues may be useful in treating peptic ulcer disease.

8152 COMPARATIVE GASTRIC ANTISECRETORY AND ANTIULCER EFFECTS OF PROSTAGLANDIN E_1 AND ITS METHYL ESTER IN ANIMALS. *(E.)* Dajani, E. Z.; Driskill, D. R.; Bianchi, R. G.; Collins, P. W. (Depts. Biological and Chemical Res., Searle Lab., P. O. Box 5110, Chicago, Ill. 60680). *Prostaglandins* 10(2): 205-215, 1975.

The effects of prostaglandin E_1 (PGE_1) and its methyl ester (PGE_1ME) on histamine-stimulated (60 µg/kg/hr, i.v.) gastric acid secretion were compared in Heidenhain pouches in six female mongrel dogs. Their antiulcer effects were compared in male Charles River rats by the exertion ulcer model. After i.v. administration of 10.0 μg/kg/dog as a bolus, PGE$_1$ and PGE$_1$ME had peak antisecretory action at 30 min with durations of 60 and 90 min, resp. There was no effect on ionic composition of the secretions. By i.v. infusion at 1.0 μg/kg/min, PGE$_1$ demonstrated significant inhibition of secretion at 120 to 135 min after initiation, while PGE$_1$ME produced significant effects from 30 min after initiation to 150 min after termination of infusion, while significantly reducing H$^+$ concentration and increasing Na$^+$. Forced exercise in rats produced deep ulceration and bleeding in controls (10.3 ulcers/rat), while 1.0 mg/kg of PGE$_1$ s.c. reduced the incidence to 5.7 ulcers/rat and PGE$_1$ME reduced the ulcer incidence to 1.5/rat. ED$_{50}$ was calculated for PGE$_1$ and PGE$_1$ME as 3.07 and 1.43 mg/kg, resp. PGE$_1$ME is a more potent and longer-acting inhibitor of histamine-induced gastric secretion and of forced exertion-induced ulcers than PGE$_1$. It is suggested that this difference is due to the increased lipophilicity of the methyl ester with resulting superior tissue distribution and reduced enzymatic β-oxidation of the carboxyl side chain which would render it inactivated.

8153 INHIBITION OF GASTRIC ACID SECRETION IN MAN BY THE TRANSCRANIAL APPLICATION OF LOW INTENSITY PULSED CURRENT.

(E.) Kotter, G. S.; Henschel, E. O.; Hogan, W. J.; Kalbfleisch, J. H. (Veteran's Admin. Hosp., 5000 West National Ave., Milwaukee-Wood, Wisc. 53193). *Gastroenterology* 69(2):359-363, 1975.

The effectiveness of transcranial electrotherapy (TCE) in reducing gastric acid secretion was studied in adult male volunteers aged 23 to 58 yr. In the first study, the basal secretion rates in five subjects were monitored before, during, and after the application of TCE at graduated current intensities. Secretion rates were monitored *via* a method of intragastric titration utilizing a pH-sensitive telemetry capsule which was ingested prior to testing by the subjects. In the second study, histamine-stimulated (0.4 mg/kg) maximum acid output was studied under basal conditions and during TCE application (1 ma current). In a third study, the uncomfortable sensations associated with high levels of TCE were simulated on the foreheads of six subjects, but no current was applied transcranially; the histamine-stimulated maximum acid output was also determined under these conditions. The first study indicated that TCE currents of 0.9 ma and greater caused a significant reduction (below control values) in basal gastric acid secretion. In the second study, TCE application resulted in highly significant reductions in histamine-stimulated maximum acid output; these reductions varied from 5.7 to 53.2%, with a mean of 30%. The third study showed no difference in maximum acid output under basal and placebo (simulated TCE discomfort) conditions, but an average reduction of 27.3% was obtained during actual TCE application. The data indicate that TCE can cause a highly significant reduction in both basal and histamine-stimulated gastric acid output. There was no permanent reduction in gastric secretion due to repeated TCE applications in a single subject.

8154 SIMULTANEOUS STUDY OF GASTRIC AND PANCREATIC SECRETION IN A PREPARATION PERFUSED EX VIVO.

(E.) Kowalewski, K.; Kolodej, A. (Surgical-Medical Res. Inst., Univ. Alberta, Edmonton, Alberta, Canada). *Surg. Obstet. Gynecol.* 141(4):595-601, 1975.

Isolation and perfusion of gastro-pancreatic-duodenal preparations from adult mongrel dogs is reported and secretory function of the isolated pancreas and stomach were studied. Under i.v. pentobarbital anesthesia, laparotomy, splenectomy and bilateral thoracotomy through both crura of the diaphragm and central tendon were performed. The esophagus was isolated, ligated and transected, and the abdominal aorta was isolated from below the renal arteries to the lower portion of the thoracic aorta. Dissection, ligation and division of the pancreatic vessels were followed by cannulation of the main pancreatic duct and ligation of the accessory duct. The duodenum was divided just distal to the pancreatic attachment. Cannulation of the stomach through a duodenal incision and cannulation of the distal duodenum were performed. Ligation and transection of the abdominal aorta, hepatic artery and common bile duct, followed by transection of the superior aorta and the portal vein, allowed the preparation to be removed *en bloc*. Aortic and portal cannulas were connected with a perfusion circuit receiving blood from a second dog. The preparation was placed in a controlled temperature chamber. Perfusion by roller-pumps was begun at 60 to 80 ml/min for 20 min, then increased to 120 to 160 ml/min for the length of the experiment (6-8 hr). Infusion of secretin (120 U/hr) reduced gastric acid output from 3.5 mEq of HCl/30 min to 0.25 mEq of HCl/30 min, and H$^+$ concentration was reduced from 120 mEq/l to 60 mEq/l with pentagastrin infusion constant at 32 μg/hr. Pancreatic HCO$_3$ output increased from 0.0 mEq/30 min to 4.1 mEq/30 min and HCO$_3$ concentration increased from 40 mEq/l to 120 mEq/l upon secretin infusion. These results are similar to previous reports for isolated pancreas and isolated stomach preparations. *Ex vivo* preparation of the gastroduodenopancreatic block is a useful tool for evaluation of stomach and pancreatic function.

8155 INCREASING ACID RESPONSE TO A MEAL IN THE CHRONIC HEIDENHAIN POUCH.

(E.) Saik, R. P. (Univ. California, San Diego, Sch. Medicine, San Diego, Calif.). *Surgery* 130(3):275-278, 1975.

Heidenhain pouches were constructed from the greater curvature of the stomach and drained with a Gregory cannula in four mongrel dogs to study long-term changes in acid output responses to a standard meat meal. No dogs demonstrated any change in basal acid output after six to eight months. At five hr after feeding, acid responses were 0.4, 0.8, 0.5 and 1.0 mEq/hr in the four dogs six to eight months after pouch construction, compared to 0.05, 0.05, 0.1 and 0.0 mEq/hr three wk after construction in each of the dogs. Gastrin outputs were not significantly changed in three dogs six to eight months after pouch construction (429 *vs* 411 pg-min/ml; 74 *vs* 165 pg-min/ml; 362 *vs* 117 pg-min/ml, resp.) and were elevated in one dog (700 *vs* 1786 pg-min/ml 8 months later). Two-hr pepsin outputs, measured in three dogs, were elevated six to eight months after pouch construction (18.72 *vs* 80.06, 34.91 *vs* 40.17, 2.38 *vs* 13.34 U of activity/ml, resp.). Light microscopy revealed more prominent mucosal villi in three of four dogs and increased fibrosis in two of four dogs at the time of sacrifice. Parietal cell counts were unchanged in three of four dogs and decreased in one (123.30 parietal cells/high-power field in pouch *vs* 202.00 cells in the fundus of the stomach). It appears that there is an increased acid response of the Heidenhain pouch to a meat meal over a long period of time, which is independent of parietal cell mass and gastrin secretion. It is suggested that pouch responses must be restudied when they are used for long-term gastrointestinal studies.

8156 EXPERIMENTAL ELECTROCOAGULATION OF DOG GASTRIC MUCOSA [abstract]. *(E.)* Papp, J. P.; Fox, J. M.; Wilks, H. S. (Blodgett Mem. Hosp., Grand Rapids, Mich.). *Gastroenterology* 68(4):1040, 1975.

8157 DEMONSTRATION OF A NEUTRAL COLLAGENASE FROM HUMAN GASTRIC MUCOSA [abstract]. *(E.)* Tucker, J. S.; Green, G.; Woolley, D.; Evanson, J. M.; Dymock, I. W. (Univ. Hosp. South Manchester, South Manchester, England). *Gut* 16(5): 404, 1975.

8158 THE INTESTINAL PHASE OF GASTRIC SECRETION IN THE DOG [abstract]. *(E.)* Cairns, D. (Cent. Middlesex Hosp., England). *Gut* 16(5):406, 1975.

8159 INHIBITION OF GASTRIN AND GASTRIC ACID BY GROWTH HORMONE RELEASE INHIBITING HORMONE [abstract]. *(E.)* Bloom, S. R.; Russell, R. C. G.; Barros D'Sa, A. A. J.; Baron, J. H.; Besser, G. M.; Hall, R.; Coy, D. H.; Kastin, A. J.; Schally, A. V. (R. Postgrad. Med. Sch., London, England). *Gut* 16(5):396, 1975.

8160 EFFECTS OF SMALL BOWEL RESECTION ON THE DEVELOPING GASTRIC MUCOSA OF THE RAT [abstract]. *(E.)* Winborn, W. B.; Guerrero, D. L. (Univ. Texas Health Sci. Center, San Antonio, Texas). *Gastroenterology* 68(4):1066, 1975.

8161 INFLUENCE OF PARTIAL SMALL BOWEL RESECTION ON GASTRIC GLANDULAR CELL KINETICS IN THE RAT [abstract]. *(E.)* Seelig, L. L., Jr. (Univ. Texas Health Sci. Cent., San Antonio, Texas). *Gastroenterology* 68(4):1062, 1975.

8162 INHIBITION OF PENTAGASTRIN STIMULATED HEIDENHAIN POUCH SECRETION BY TRYPTOPHAN [abstract]. *(E.)* Valenzuela, J. E.; Bugat, R.; Grossman, M. I. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterology* 68(4):1056, 1975.

8163 STIMULATION OF GASTRIC ACID SECRETION BY THE CARBOXY-TERMINAL DIPEPTIDE AMIDE OF GASTRIN [abstract]. *(E.)* Bugat, R.; Grossman, M. I. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterology* 68(4):1055, 1975.

8164 PROTECTIVE EFFECT OF METIAMIDE ON ASPIRIN AND BILE INDUCED ACUTE EROSIVE GASTRITIS [abstract]. *(E.)* Mann, N. S.; Sachdev, A. (Univ. Louisville Sch. Med., Louisville, Ky.). *Gastroenterology* 68(4):945, 1975.

8165 CARBENOXOLONE EFFECTS ON GASTRIC MUCOSAL PERMEABILITY AND BLOOD FLOW [abstract]. *(E.)* Simons, M.; Moody, F. G. (Dep. Surg., Univ. Utah, Salt Lake City, Utah). *Gastroenterology* 68(4): 957, 1975.

8166 SECRETION OF GASTRIC MUCUS IN RATS SUBJECTED TO COLD-RESTRAINT STRESS [abstract]. *(E.)* Pereira, J. N.; Hohnke, L. A.; Mears, G. A. (Cent. Res., Pfizer, Inc., Groton, Conn.). *Gastroenterology* 68(4):966, 1975.

8167 HISTAMINE INDUCED HYPOCALCEMIA IN THE RAT: NECESSITY OF A GASTRIC FACTOR [abstract]. *(E.)* Norbera, H. P.; Atlas, B.; Schulak, J. A.; Kaplan, E. L. (Dept. Surg., Univ. Chicago, Chicago, Ill.). *Gastroenterology* 68(4): 922, 1975.

8168 EFFECTS OF CCK-OP (CHOLECYSTOKININ-OCTAPEPTIDE) AND PGE$_2$ (PROSTAGLANDIN E$_2$) ON DNA AND RNA OF GASTRIC AND DUODENAL MUCOSA [abstract]. *(E.)* Johnson, L. R. (Univ. Texas Med. Sch., Houston, Texas). *Gastroenterology* 68(4):920, 1975.

8169 IS cAMP REALLY PRESENT IN GASTRIC SECRETION [abstract]? *(E.)* Holian, O.; Gabrys, B. F.; Nyhus, L. M.; Bombeck, C. T. (Abraham Lincoln Sch. Med., Univ. Illinois, Chicago, Ill.). *Gastroenterology* 68(4):915, 1975.

8170 GASTRIC ACID SECRETION AND CIRCULATING GASTRIN LEVELS IN COLD-RESTRAINT STRESSED RATS [abstract]. *(E.)* Hohnke, L. A.; Pereira, J. N.; Wilder, D. E. (Pfizer Cent. Res., Groton, Conn.). *Gastroenterology* 68(4):914, 1975.

8171 GROWTH HORMONE: A POSSIBLE REGULATOR OF GASTRIN [abstract]. *(E.)* Enochs, M. R.; Johnson, L. R. (Univ. Texas Med. Sch., Houston, Texas). *Gastroenterology* 68(4):889, 1975.

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8186 EVIDENCE FOR SEPARATE HISTAMINE AND PROSTAGLANDIN SENSITIVE ADENYLATE CYCLASES (AC) IN GUINEA PIG GASTRIC MUCOSA (GM) [abstract]. *(E.)* Wollin, A.; Code, C. F.; Dousa, T. P. (Mayo Clin., Rochester, Minn.). *Clin. Res.* 23(3):260A, 1975.

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8193 PARAMETERS FOR INTRADUODENAL pH GRAPHS IN DOGS. *(Rus.)* Kienia, A. I. (Dept. Human Animal Physiology, State Univ., Gomel, USSR). *Fiziol. Zh. SSSR* 61(7):1086-1089, 1975.

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8196 THE STUDY ON THE EFFECTS OF THERAPEUTIC DRUGS FOR PEPTIC ULCER ON TISSUE RESPIRATION AND GLYCOLYSIS OF GASTRIC MUCOSA. *(E.)* Matsubayashi, K.; Yoshizumi, M.; Koga, N.; Nishimura, R.; Tachibana, M.; Ueda, A.; Sano, H.; Yamate, S.; Tanaka, K. (Kurume Univ. Sch. Medicine, Kurume, Japan). *Kurume Med. J.* 21(4):123-128, 1974.

8197 GASTRIC MOTILITY AND GASTRIC ACIDITY IN EXPERIMENTAL GASTRIC ULCER. *(Cz.)* Popperova, E.; Niks, M.; Hulin, I. (Univ. Komenskeho v Bratislave, veduci doc, MUDr. M. Niks, CSc.). *Folia Fac. Med. Univ. Comenianae Bratisl.* 12(1):55-105, 1974.

8198 CHANGES IN BLOOD GASTRIN IN MAN AFTER INTRAVENOUS INJECTION OF CORTISOL. *(It.)* Giordano, G.; Marugo, M. (Istituto Scientifico Medicina Interna, Universita Genova, Italy). *Boll. Soc. Ital. Biol. Sper.* 50(22):1905-1910, 1974.

8199 EARLY VARIATIONS IN GASTRIC SECRETION AND BLOOD GASTRIN LEVELS AFTER ANTRAL TRANSPORTATION INTO COLON IN THE RAT. *(Fr.)* Bonnefond, A.; Nasca, S.; Dubrasquet, M. (INSERM U-10, 170, Boulevard Ney, F 75877 Paris Cedex 18, France). *Biol. Gastroenterol. (Paris)* 8(1):45-52, 1975.

See also, 8054, 8365.

SECRETION AND METABOLISM

Pancreas

8200 THE RELATIVE POTENCY OF THE CRICK-HARPER-RAPER UNIT AND THE GIH CLINICAL UNIT OF SECRETIN. *(E.)* Braganza, J. M.; Howat, H. T.; Kay, G. (Manchester Royal Infirmary, England). *Gut* 16(7): 549-552, 1975.

A reinvestigation of the relationship between the Crick-Harper-Raper (CHR) and the GIH clinical units (CU) of secretin was undertaken in four anesthetized cats to determine whether the CHR standard used by the Boots Company to assay secretin had lost some specific activity. The splanchnic nerves were divided extraperitoneally. The pancreatic duct was cannulated, and the common bile duct was obliterated by the ligature retaining the cannula. The pylorus was occluded by a broad tape ligature. Since a preliminary experiment indicated that one CHR U of Boots secretin was about four times less potent than one CU of GIH secretin, rapid i.v. injections of one and two CHR U/kg of Boots secretin and 0.25 and 0.50 CU/kg of GIH secretin were used in each cat. The order of administration of the secretins was determined by a 2 x 2 Latin square arrangement, with the restrictions of equal number of observations/dose, equal number of doses/substance, equal logarithmic spacing of the doses, and that the higher doses of the two secretins were not given consecutively. Observations were recorded at 15-min intervals and 30 to 45 min were allowed to elapse between injections. The volume of pancreatic juice was recorded to the nearest 0.01 ml. Bicarbonate concentration was measured by back titration after treatment with 0.1 N HCl. A preliminary analysis using three doses of GIH secretin (0.125, 0.25, 0.5 CU/kg) and three doses of Boots secretin (0.5, 1.0, 2.0 CHR U/kg) showed that a linear equation significantly described the relation between log dose and volume of pancreatic juice or bicarbonate output in each instance. The log-dose response lines for Boots and GIH secretin (2 x 2 assay) were parallel for both volume of juice and bicarbonate output. A comparison of the relative potency of the GIH CU and the CHR U of Boots secretin, as specified on the labels, yielded a ratio of 3.8:1 for rate of flow and 4:1 for bicarbonate. From the data presented here, doubling the dose of Boots secretin from 2 to 4 CHR U/kg does not increase the volume or bicarbonate output of pancreatic juice.

8201 THE EFFECT OF ACUTE ETHANOL ADMINISTRATION ON THE EXOCRINE PANCREATIC SECRETION OF THE PIG. *(E.)* Wheatley, I. C.; Barbezat, G. O.; Hickman, R.; Terblanche, J. (Univ. Cape Town Med. Sch., South Africa). *Br. J. Surg.* 62(9):707-712, 1975.

The acute effects of ethanol (0.5 ml/kg by continous i.v. infusion for 2 hr or 5% in 0.15 M NaCl infused intragastrically at a rate of 20 ml/kg/hr for 1 hr) on secretin- (1 U/kg/hr) and cholecystokinin- (1 U/kg/hr) stimulated exocrine pancreatic secretion were studied in anesthetized female Large White X Landrace pigs with chronic pancreatic and gastric fistulas. The pancreatic fistulas were established with a new H-type pancreatic cannula. With the gastric fistula open or closed, alcohol, Nacl (0.15 M) or mannitol (15% in 0.15 M NaCl) administration was superimposed on the background hormonal stimulation. Samples from the fistulas were collected at 15 min intervals, and blood was taken 30-240 min after the commencement of alcohol administration. With the gastric cannula open, i.v. alcohol significantly increased the mean volume of gastric juice secreted without changing the pancreatic volume of bicarbonate secretion. The protein content in the pancreatic juice decreased significantly, the maximal depression occurring at the end of the fourth hr when the blood alcohol level peaked (0.09 mg/100 ml blood). With the gastric cannula closed, i.v. alcohol caused a marked rise in the mean volume of pancreatic secretion and in the bicarbonate output; the protein output did not vary significantly from basal levels. Infusion of saline produced no significant changes in any parameters if the gastric cannula was open or closed. With intragastric alcohol, there was a pronounced and persistent rise in the mean volume of pancreatic secretion, the bicarbonate output, and the protein output. Peak secretion was reached simultaneously with the peak blood alcohol level 2 hr after the beginning of alcohol administration. Intragastric mannitol produced a rapid rise in pancreatic secretion volume followed by a rapid decline after the third hr to basal levels; parallel effects on bicarbonate and protein outputs were observed. The secretin-like effect of alcohol on pancreatic secretion volume and bicarbonate output did not appear to be a direct effect of alcohol on the pancreas; it is likely that the pancreatic effects were produced by alcohol-released gastrin or cholecystokinin.

8202 MECHANISM OF RELEASE OF ENDOGENOUS CHOLECYSTOKININ BY JEJUNAL AMINO ACID PERFUSION IN MAN. *(E.)* Ertan, A.; Brooks, F. P.; Arvan, D.; Williams, C. N. (Philadelphia Veteran's Admin. Hosp., Pa.). *Am. J. Dig. Dis.* 20(9):813-823, 1975.

The mechanism by which perfusion of the jejunum with a mixture of amino acids mediates an increase in exocrine pancreatic and biliary secretions was studied in five normal human subjects. The tip of one lumen tube (I) was placed about 40 cm distal to the ligament of Treitz and the tip of a second tube (II) was passed to the fourth portion of the duodenum. A mixture of amino acids (MAA) or saline solution was infused through tube I and, on other occasions, this perfusion was combined with a single application of oxethazaine hydrochloride (0.5 mg/kg of a 0.4% solution) to the proximal jejunum at the beginning of the first or second hr of MAA perfusion. At other times, the patients received i.v. cholecystokinin (CCK) with or without topical oxethazaine, and/or atropine sulfate (1 mg/l) in the MAA perfusate. Duodenal samples were continuously aspirated through tube II. The pancreatic (trypsin) and biliary (bile salt) responses to jejunal MAA perfusion were significantly reduced in four patients for about one hr after oxethazaine application (during the second hr of perfusion); in the following hr, the pancreatic secretory and biliary responses were partially restored. Oxethazaine also inhibited the bicarbonate, amylase, protein, and bilirubin responses to jejunal MAA. The response to MAA perfusion was also significantly reduced, for 60 to 75 min, when oxethazaine was given during the first hr of perfusion. The responses to i.v. CCK and jejunal saline perfusion were not affected by jejunal oxethazaine. Oxethazaine produced no local or systemic side effects and no histological changes in the jejunum. All responses to jejunal MAA perfusion were significantly reduced by the addition of atropine to the perfusate; when the MAA perfusion was continued without atropine, the responses were partially restored. The jejunal application of atropine did not alter the pancreatic and biliary responses to i.v. CCK or jejunal saline perfusion. These results support the hypothesis that the endogenous release of CCK from the jejunal mucosa depends on the stimulation of intact cholinergic receptors, while exogenous CCK appears to act directly on the pancreatic cell.

8203 ROLE OF CALCIUM IN EXOCRINE PANCREATIC SECRETION. I. CALCIUM MOVEMENTS IN THE RABBIT PANCREAS. *(E.)* Schreurs, V. V. A. M.; Swarts, H. G. P.; De Pont, J. J. H. H. M.; Bonting, S. L. (Dept. Biochemistry, Univ. Nijmegen, The Netherlands). *Biochim. Biophys. Acta* 404(2):257-267, 1975.

The pattern of calcium movements in the intact, isolated rabbit pancreas and in pancreatic fragments was studied. The pancreases were isolated from male and female New Zealand white rabbits and both the intact and fragmented tissues were incubated in balanced salt solution. After one hr, the tissues were placed in medium containing ^{45}Ca^{2+} and, occasionally, (^{3}H)mannitol plus 2 mM mannitol. In some experiments, carbachol (10^{-5} M) or acetylcholine (10^{-5} M) was added to the medium, and in other cases partial or nearly complete removal of $^{45}Ca^{2+}$ was effected prior to stimulation. In the intact pancreas experiments, pancreatic fluid was collected at five-min intervals, and in the fragmented pancreas experiments, efflux medium samples were collected at five- or 15-min intervals. The addition of $^{45}Ca^{2+}$ to the incubation medium resulted in the immediate appearance of isotope in the fluid secreted from the intact tissues; a constant specific activity was reached within 30 min, the absolute activity in the secreted fluid being 30 to 40% of that in the incubation medium. The addition of carbachol after two-hr preincubation with $^{45}Ca^{2+}$ resulted in enzyme secretion and calcium release; a maximal increase in $^{45}Ca^{2+}$ secretion was noted 10 min after maximal enzyme secretion and calcium release. The increase in $^{45}Ca^{2+}$ secretion was reduced by the partial removal of $^{45}Ca^{2+}$ prior to stimulation; the reduction was nearly proportional to the amount of isotope removed. (^{3}H)mannitol added to the incubation medium also appeared in the secretion fluid and reacted to carbachol in the same manner as $^{45}Ca^{2+}$. Upon repeated acetylcholine stimulation, a $^{45}Ca^{2+}$ peak appeared even in the virtual absence of enzyme secretion; the peak coincided with a small total calcium peak. Efflux studied in the pancreatic fragments showed a carbachol-stimulated $^{45}Ca^{2+}$ efflux in addition to amylase release. The data indicate that there are three patterns of calcium movement in the rabbit pancreas which can be influenced by cholinergic agents: an extracellular route for calcium and other small molecules and ions; a calcium release across the apical membrane along with the enzymes, originating from a pool which does not freely exchange with $^{45}Ca^{2+}$ in the bath; and a calcium flux across the serosal membrane which involves calcium exchanging freely with $^{45}Ca^{2+}$ from the bath. The latter flux is thought to result from an increase in cytoplasmic calcium, which may be involved in the stimulus-secretion coupling of pancreatic enzyme secretion.

8204 ENTEROPANCREATIC CIRCULATION OF DIGESTIVE ENZYME AS A CONSERVATION MECHANISM. *(E.)*

Götze, H.; Rothman, S. S. (Dept. Physiology, Univ. California, San Francisco, Calif. 94143). *Nature* 257(5527):607-609, 1975.

An effort was made to more fully determine whether the enteropancreatic circulation of digestive enzyme is a trace process or a process in which substantial amounts of enzyme are circulated and thereby conserved. The pancreatic duct of male white New Zealand rabbits was cannulated *in situ* after a median laparotomy under DIAL-urethane anesthesia and subsequent to a 20-hr fast. The continuity of the gastrointestinal lumen was maintained; protein content was estimated by ultraviolet absorption at 280 nm. After a 30-min unstimulated collection period, maximal secretion of both protein and fluid was continuously elicited by half-hr injections of acetyl-β-methylcholine (0.5 mg/kg, s.c.) and porcine secretin (1 Ivy dog U/kg, i.v.). Samples were collected at 30 min intervals. When pancreatic juice was completely diverted from the intestine, a roughly exponential decay in protein secretion was observed. In the continued presence of the cholinergic stimulus, secretion decreased by about 90% over a 4.5 hr period, although it was still enhanced relative to the secretion of protein from unstimulated glands at the same time. In further experiments, pancreatic digestive enzyme secretion was collected, stimulated as before, and measured in its protein content and immediately reintroduced into the duodenum, thereby maintaining the continuity of the natural process. The fall-off under these conditions was indeed less than during diversion. A relatively steady protein output was maintained under these conditions for about three hr, although not at maximal rates. The increase in protein secretion after protein instillation into the intestinal lumen was 61.3% of the amount instilled for the complete experiment and reached a maximum of 83% for the period of peak response. An additional experiment was performed in which pancreatic juice was again completely diverted, but at 120 min one Ivy dog U of purified cholecystokinin-pancreozymin/kg was injected in addition to the other stimulants. No additional augmentation of protein secretion was observed. While circulation of digestive enzyme is the most direct interpretation of these data, the injected or instilled enzyme could still have produced the effect in other ways such as by the release of as yet undescribed secretagogues or by regulating enzyme secretion directly at the acinar cell level.

8205 THE COURSE AND NATURE OF ACINAR CELL DEATH FOLLOWING PANCREATIC LIGATION IN THE GUINEA PIG. *(E.)*

Zeligs, J. D.; Janoff, A.; Dumont, A. E. (New York Univ. Sch. Medicine, New York, N. Y.). *Am. J. Pathol.* 80(2):203-226, 1975.

Ultrastructural studies carried out on female Camm-Hartley albino guinea pig pancreas at various intervals after pancreatic ligation are described. The present studies were undertaken with specific regard to the nature of acinar cell death (ACD). The mechanisms involved in this process are of interest in the evaluation of pancreatic ligation as a model for human disease, including cystic fibrosis and pancreatitis. The animals were fasted for 6 to 15 hr prior to surgery and anesthetized with 4 mg Nembutal/100 g. With sterile technique, a silk ligature was passed about the entire pancreas (insuring that no secondary ductal patency persisted) and tied tightly midway along the pancreatic tail. This procedure provided a "ligated" arm of pancreatic tissue (distal to ligature) as well as a portion of the gland with uninterrupted ductal drainage which served as control tissue. After the desired period of ligation, guinea pigs were refasted and reanesthetized and the abdomen was reopened for excision of control and experimental portions of pancreas. Ultrastructural studies after periods of ligation (0, 0.5, 1, 3, 4, and 12 hr; 1, 2, 3, 4, 5, 7, and 10 days; 2, 3, 4, and 12 wk; and 1 and 2 yr) suggested a biphasic pattern of ACD. Early phase ACD involved only a small portion of acinar cells and occurred within a few hours of ligation. It was preceded by swelling and vesiculation of the rough endoplasmic reticulum. Morphometric measurements disclosed cellular swelling at this time, and NaCl equilibrium studies demonstrated a change in cellular osmoregulation. Late phase ACD, characterized by cellular wasting and autophagic vacuole formation, became prominent several days after ligation. Marked increases in lysosomal enzyme activities were found in tissue homogenates at this time, and acid phosphatase electron histochemistry localized the majority of this increased activity to lysosomes and autophagic vacuoles within the acinar cells. The etiology and nature of both phases of ACD are discussed. It is suggested that ACD is not a response of cells subjected to stress, but that it represents part of an orderly remodeling process designed to remove nonfunctioning tissue and to insure against a potentially lethal form of pancreatitis.

8206 PANCREATIC SECRETION IN THE RAT: INFLUENCES OF OPERATIVE PROCEDURE, ANESTHESIA, HYPOTHERMIA AND DRAINAGE OF GASTRIC OR PANCREATIC JUICE.

(Fr.) De Waele, B.; Desmul, A.; Wissocq, P.; Kiekens, R. (Brugmann Hosp., Vrije Univ., Brussels, Belgium). *Biol. Gastroenterol. (Paris)* 7(4): 253-263, 1974.

Investigations were performed on three groups of rats to establish optimum conditions for studying pancreatic secretion in waking rats with stable body temperatures. All rats were anesthetized with chloral hydrate (46 mg/100 g, i.v.) for about 1.5 hr. Pancreatic fistulas were established by a modification of Colwell's technique in which none of the principal pancreatic ducts are ligated. Rats studied included: 1) rats with only a pancreatic fistula; 2) pylorus-ligated rats with gastric and pancreatic fistulas; and 3) pylorus-ligated rats with gastric and pancreatic fistulas prepared in such a way that pancreatic juice could be injected into the duodenum through a catheter. In group 1, basal pancreatic secretion was very low immediately after surgery. Secretion of pancreatic juice and the HCO_3^- and protein outputs increased gradually, reaching a plateau 48 hr after surgery; this was maintained with little variation for the next 44 hr. Similar results were obtained in group 2. In group 2, basal gastric acid output was very low after surgery, but increased gradually and stabilized at 24.0 ± 5.9 μEq of HCl/100 g/hr. None of the rats in any of the three groups developed gastric ulcers. Reanesthesia of rats in group 1 with urethane (125 mg/100 g, i.p.) two or three days after surgery caused a slight decrease in the volume of pancreatic juice and a moderate but significant decrease in protein output without any appreciable change in the HCO_3^- output. In group 2, urethane anesthesia had no effect on pancreatic secretion but totally inhibited gastric acid secretion. When rats were subjected to hypothermia at 32 and 35 C, no change occurred in the volume of pancreatic secretion, the HCO_3^- output increased and the protein output decreased. At 32 C, the protein output decreased to at least 50% of the basal value. Reinjection of pancreatic juice into the duodenum produced a moderate but significant decrease in the protein output (by a mean of 18%); decreases in volume and the HCO_3^- output were not significant. The protein output increased again after reinjection of pancreatic juice, and there was a correlation between the trypsinogen output and the total protein output. It is concluded that, in rats, pancreatic secretion should be studied 48 hr after establishment of pancreatic fistulas; conscious animals with body temperatures stabilized at 38 C should be employed.

8207 ALTERATIONS IN PANCREATIC ACINAR CELL ORGANELLES DURING CIRCULATORY SHOCK.

(E.) Herlihy, B. L.; Lefer, A. M. (Univ. Virginia Sch. Medicine, Charlottesville, Va.). *Circ. Shock* 2(3):143-153, 1975.

The alterations in pancreatic subcellular particles and their distribution during splanchnic artery occlusion (SAO) shock and the modification of these changes by chronic pancreatic duct ligation were studied in adult cats of both sexes. The main pancreatic duct and the accessory pancreatic duct were ligated and, five to six wk later, the animals were subjected to sham SAO, SAO shock, or chronic duct ligation shock. After a two-hr occlusive period, the artery clamps were removed and the pancreas was excised when the mean arterial blood pressure declined to 50 to 60 mm of Hg. The pancreas was subjected to cell fractionation by differential centrifugation and assayed for β-glucuronidase, cathepsin D, neotetrazolium succinate reductase, amylase, and protein. The tissue was also examined under the electron microscope. There was no difference in size between the control and shock pancreases, but the pancreatic atrophy associated with duct ligation dramatically reduced the size of the ligated pancreases. Amylase and neotetrazolium succinate reductase activities and protein content were significantly higher in the control tissues than in the SAO shock tissues, and were significantly higher in the SAO shock tissues than in the duct-ligation-shock tissues. There were no significant changes in lysosomal enzyme, cathepsin D, or β-glucuronidase. The relative specific activity of amylase was higher in the S_4 fractions and lower in the P_3 fractions of the shock groups than in the same fractions of the control groups. β-Glucuronidase relative specific activity was higher in the P_2 fraction of the shocked pancreases than in the same fraction of the control tissues, and was also higher in the P_4 fraction of the duct ligation pancreases than in the same fraction of the duct-ligation-shock pancreases. Cathepsin D relative specific activity was higher in the P_3 fraction of the shock groups than in the P_3 fraction of the controls. The shock pancreases demonstrated a decreased relative specific activity of neotetrazolium succinate reductase in the P_3 fraction and an increased activity in the P_2 fraction. As demonstrated by electron microscopy, the duct-ligated tissues contained relatively dark lysosomes with many apparently phagocytosed bodies inside them. The data indicate that pancreatic subcellular organelles may play an important role in the development of the shock state and that modification of pancreatic acinar cells by chronic pancreatic duct ligation can help to prevent the autolytic response of these cells.

8208 EFFECTS OF CHOLERA TOXIN ON CYCLIC ADENOSINE 3',5'-MONOPHOSPHATE CONCENTRATION AND SECRETORY PROCESSES IN THE EXOCRINE PANCREAS. *(E.)* Smith, P. A.; Case, R. M. (Univ. Medical Sch., Newcastle upon Tyne, NE1 7RU, England). *Biochim. Biophys. Acta* 399(2):277-290, 1975.

The effect of purified cholera toxin (1.0 μg/ml) on the secretory processes of the exocrine pancreas was studied in the isolated, saline-perfused cat pancreas and in baby rat uncinate pancreas incubated in medium similar to the cat perfusion fluid. Samples of pancreatic juice from the cat experiments were analyzed for amylase activity as an index of total enzyme secretion. In addition, cyclic AMP concentrations were determined in small pieces of rat and cat pancreas. The cholera toxin evoked a biphasic secretory response from the perfused cat pancreas. A small initial phase, which was noted within minutes of toxin application, was an artifact due to the presence of NaN_3 in the toxin preparation. The second, sustained phase of secretion was due to the action of the toxin itself and began within 30-60 min, increasing in magnitude for many hours and persisting following the removal of toxin from the perfusion fluid. The pattern and magnitude of the second secretory response did not change with toxin concentrations between 0.5 and 2.0 μg/ml. The second toxin-induced secretory response was accompanied by a parallel rise in the tissue cyclic AMP concentration; this phenomenon was demonstrated in both the cat and rat tissues. Theophylline (5×10^{-4} M) caused a modest increase in toxin-stimulated secretion and in the tissue cyclic AMP concentration (83.7% and 66.3%, resp.). Cholera toxin did not stimulate enzyme secretion by the incubated rat pancreas. These results offer no evidence that cyclic AMP plays a mediating role in the regulation of cholecystokinin-pancreozymin- or acetylcholine-stimulated pancreatic enzyme secretion.

8209 PROTEIN DIGESTION AND ABSORPTION IN RATS WITH PANCREATIC DUCT OCCLUSION [abstract]. *(E.)* Curtis, K. J.; Kim, Y. S. (VA Hosp., San Francisco, Calif.). *Gastroenterology* 68(4):1071, 1975.

8210 THE PHYSICAL CHEMISTRY OF PANCREATIC CALCIFICATION AND STONE FORMATION: A TEST OF THE MODEL IN CANINE PANCREATIC JUICE [abstract]. *(E.)* Moore, E. W.; Zimmerman, M. J. (Virginia Commonwealth Univ., Richmond, Va.). *Gastroenterology* 68(4):959, 1975.

8211 THE PHYSICAL CHEMISTRY OF PANCREATIC CALCIFICATION AND STONE FORMATION: II. THE EQUILIBRIUM FORMATION CONSTANTS OF THE SOLUBLE CALCIUM COMPLEXES $CaHCO_3^+$ AND $CaCO_3$ [abstract]. *(E.)* Moore, E. W.; Verine, H. J. (Virginia Commonwealth Univ., Richmond, Va.). *Gastroenterology* 68(4):960, 1975.

8212 THE PHYSICAL CHEMISTRY OF PANCREATIC CALCIFICATION AND STONE FORMATION: III. A THERMODYNAMIC MODEL FOR THE PHYSIOCHEMICAL STATE OF CALCIUM IN PANCREATIC JUICE [abstract]. *(E.)* Moore, E. W.; Verine, H. J. (Virginia Commonwealth Univ., Richmond, Va.). *Gastroenterology* 68(4):959, 1975.

8213 DISSOCIATION OF INTRAPANCREATIC AMYLASE AND CHYMOTRYPSINOGEN BEHAVIOUR FOLLOWING PZ-LIKE STIMULATION BY OLEIC ACID [abstract]. *(E.)* Dagorn, J. C.; Paradis, D.; Morisset, J. (GI Res. Univ., Sherbrooke Univ., Sherbrooke, Quebec, Canada). *Gastroenterology* 68(4):879, 1975.

8214 INHIBITION OF SECRETIN RELEASE BY ANESTHESIA [abstract]. *(E.)* Boden, G.; Sivitz, M. C.; Brander, W.; Essa, N.; Landor, J. H. (Temple Univ. Health Sci. Cent., Philadelphia, Pa.). *Gastroenterology* 68(4):865, 1975.

8215 ADENYL CYCLASE AND cAMP IN ACUTE EXPERIMENTAL PANCREATITIS: BIOCHEMICAL AND HISTOCHEMICAL STUDY [abstract]. *(E.)* Gabrys, B. F.; Holian, O.; Mackenzie, M.; Nyhus, L. M.; Bombeck, C. T. (Abraham Lincoln Sch. Med., Chicago, Ill.). *Gastroenterology* 68(4):896, 1975.

8216 CHANGES IN PANCREATIC SECRETIONS (PS), AMINO ACID TRANSPORT (AT) AND ENTEROKINASE ACTIVITY (EA) AFTER PROXIMAL INTESTINAL RESECTION (PR) IN THE RAT [abstract]. *(E.)* Van Caillie, M.; Morin, C. L.; Ling, V.; Deschenes, N. (Hosp. Saint Justine, Montreal, Quebec, Canada). *Gastroenterology* 68(4):1064, 1975.

See also, 8137, 8154, 8183, 8251, 8279, 8393.

Hepatobiliary Tract

8217 FUNCTIONAL HETEROGENEITY OF RAT LIVER PARENCHYMA AND OF ISOLATED HEPATOCYTES.

(E.) Sasse, D.; Katz, N.; Jungermann, K. (Anatomisches Institut, Albert-Ludwigs-Universität, 78 Freiburg, Germany). *FEBS Lett.* 57(1):83-88, 1975.

The functional heterogeneity of rat liver parenchyma was studied in relation to the fasting interval. Female Wistar rats were fasted for 1, 8, 24 or 36 hr prior to liver exsanguination *in situ* by the nonrecirculating preperfusion technique used for isolating hepatocytes. In cryostat sections, glucose-6-phosphatase (G-6-P) was demonstrated by precipitating phosphate liberated from glucose-6-phosphate using lead. Glycogen synthetase (GS) was detected by staining glycogen using the PAS reaction. Glycogen phosphorylase (GP) was located by staining glycogen with Lugol's solution. The size of areas were estimated by planimetry. In fed rats, G-6-P activity was high in periportal areas and absent around central veins. GS and GP were restricted to periportal zones. Glycogen was demonstrated in all hepatocytes. The GS level after 24-hr starvation was very low in periportal areas, whereas GP increased with some infiltration into intermediate and perivenous zones. The G-6-P level was not altered after eight hr of starvation, but after 24 hr, high activity was found in all three zones with a value of 8.70 U/g of liver in 24-hr-starved rats and 4.45 U/g of liver in fed rats. The amount of G-6-P reached its highest level in zone 3 after 36 hr of starvation. The area occupied by G-6-P increased from 60% in fed rats to 85% in 24-hr starved rats. This was due more to an increase in the number of enzyme-rich cells than to an absolute increase in enzyme levels. Thus, hepatocytes from the same physiologic state can have a different complement of active enzymes which probably also have different metabolic functions.

8218 CRITIQUE OF THE "CRITICAL MASS" HYPOTHESIS OF THE REGENERATION OF LIVER CELLS. *(E.)*

Togendorff, J.; Trebin, R.; Ruhenstroth-Bauer, G. (Max-Planck-Institut Biochemie, Martinsried bei Munchen, Germany). *Am. J. Pathol.* 80(3):519-524, 1975.

Johnson's hypothesis that the regulation of liver cell regeneration is triggered by the critical mass of the cells was examined. Analysis of the equations derived by Johnson showed that Equation 3 does not mathematically describe the volume reduction of individual cells occurring 60 hr after partial hepatectomy. In fact, the equation describes the growth of the remaining fraction of the liver as though it were a consequence of the increase in volume of each individual cell. According to this equation, cells would grow by 100% following a 50% reduction of the liver and by 400% when only one-fifth of the organ is conserved. The applicability of the Johnson theory was further checked by determining the volume distribution of hepatocytes and the mitotic index at 12 to 138 hr after partial hepatectomy in female BDE-inbred rats. The dispersion of values was too significant to indicate the probability distribution necessary to confirm the existence of a critical volume. Thus, the critical volume theory is not suitable for use in describing the mitotic regulation of liver regeneration.

8219 PROLIFERATION OF MONONUCLEAR PHAGOCYTES (KUPFFER CELLS) AND ENDOTHELIAL CELLS IN REGENERATING RAT LIVER: A LIGHT AND ELECTRON MICROSCOPIC CYTOCHEMICAL STUDY.

(E.) Widmann, J. J.; Fahimi, H. D. (Harvard Medical Sch., Boston, Mass.). *Am. J. Pathol.* 80(3):349-366, 1975.

The proliferation of littoral cells in regenerating rat liver after partial hepatectomy was investigated using endogenous peroxidase and uptake of large (0.8 μ) latex particles as markers of Kupffer cells. Female Charles River rats were subjected to two-thirds partial hepatectomy and sacrificed at intervals up to 11 days. Prior to sacrifice, the animals were injected i.v. with latex and their livers were fixed by perfusion through the portal vein with glutaraldehyde. Tissues from two different areas of each of the remaining lobes were processed for cytochemical localization of the peroxidase. The sinusoidal cells exhibited a marked regenerative response after partial hepatectomy. Peroxidase activity persisted in the endoplasmic reticulum of Kupffer cells during mitosis. Furthermore, the latex particles were exclusively localized in peroxidase-positive cells, thus confirming their identity as dividing Kupffer cells. Quantitative counts revealed that the peak mitotic activity of Kupffer cells occurred at 49 hr, whereas that of endothelial cells was at 96 hr after partial hepatectomy. No morphologic evidence of transformation of endothelial cells or monocytes to Kupffer cells was found. These results suggest that after partial hepatectomy, Kupffer cells in regenerating liver are formed predominantly by local cell division.

8220 STIMULATION OF HEPATOCYTES AND LYMPHOCYTES IN VITRO BY LIVER REGENERATION. *(E.)*

Sakai, A.; Kountz, S. L. (Downstate Med. Cent., State Univ. New York, Brooklyn). *Nature (Lond.)* 257(5521): 53-54, 1975.

The mechanism by which hepatectomy and subsequent liver regeneration modifies the immune reaction and stimulates DNA synthesis was studied *in vitro* using sera from male Lewis rats subjected to 70% partial hepatectomy or sham surgery. The animals were exsanguinated 8 hr after surgery, and primary liver cell cultures derived from Lewis rat fetuses (18-20 days gestation) were incubated with the sera at a final concentration of 10% and with ^{3}H-thymidine (2.5 μCi/ml). Lymphocyte suspensions from Lewis rats were similarly treated. A marked increase in DNA synthesis was seen in the liver cells cultured with serum from the partially hepatectomized rats (PH serum); serum from sham-operated syngeneic (Lewis) and allogeneic (BN) rats was also mitogenic in this system. The PH serum had no mitogenic effect on rat kidney cell cultures. Serum from partially hepatectomized, sham-operated, and normal rats also stimulated lymphocyte DNA synthesis; the effect of PH serum was significantly greater than that of the other 2. Furthermore, the PH serum stimulated mitosis of both liver cells and lymphocytes significantly more than sera from the normal and sham-operated animals. The results are consistent with the hypothesis that hepatectomy increases a mitogenic serum humoral factor which stimulates both hepatocytes and lymphocytes in culture; it does not appear to decrease inhibitor. It remains to be seen whether there is one factor or more triggering hepatocyte and lymphocyte replication.

8221 THE FORMATION OF ENLARGED AND GIANT MITOCHONDRIA IN THE AGING PROCESS OF HUMAN HEPATIC CELLS. *(E.)* Sato, T.; Tauchi, H. (Aichi Cancer Center Hosp., Nagoya, Japan). *Acta Pathol. Jpn.* 25(4):403-412, 1975.

Liver tissue from 61 Japanese men and women (aged 21-81 yr) was studied ultramicrometrically to determine the mechanism of formation of enlarged and giant mitochondria during the aging process in human hepatic cells. The subjects showed no abnormalities on routine liver function tests and liver samples were microscopically free of pathological conditions. The number of mitochondria per hepatic cell area significantly decreased with age after 60 yr; their size significantly increased after 65 yr of age. Although the total mitochondria area per hepatic cell area increased with age, it decreased slightly between 60 and 64 yr of age. In subjects aged less than 49 yr, the mitochondrial cristae were sparsely distributed (0.75-1.70 μ^2 in area) in the majority of mitochondria. In the early half of the seventh decade of life, the cristae were compactly distributed in the mitochondria, while in subjects aged 70 yr or more, the mitochondrial cristae were comparatively thinly distributed. The enlarged mitochondria in all age groups showed no evidence of degeneration or swelling, and the membrane systems demonstrated distinct cytochrome c oxidase activity. Intramitochondrial inclusion substances increased in those older than 65 yr and were digested after incubation with RNase. It appears that the abnormal growth of mitochondria is due to incomplete division following the synthesis of new mitochondrial material during the process of hypertrophy. The hypertrophic processes appear to begin with an increase in the cristae.

8222 THE CELLULAR DISTRIBUTION OF LIPOSOMES IN THE LIVER OF NEWBORN RATS. *(E.)* De Barsy, T.; Devos, P.; Van Hoof, F. (Lab. Clin. Physiol., Univ. Louvain, I.C.P., Bruxelles, Belgium). *Biochem. Soc. Trans.* 3(1):159-160, 1975.

Attempts were made to inhibit the postnatal degradation of rat liver glycogen by inhibiting the hepatic lysosomal α-glucosidase with specific antibodies entrapped in liposomes. As much as 30-50% of the fluorescein-labeled antibodies were incorporated into liposomes composed of lecithin, cholesterol, and stearylamine in a molar ratio of 7:2:1. A sample (0.1 ml) of this liposome suspension was administered to newborn rats through the umbilical cord vein, and the fate of the liposomes and labeled proteins in the liver were studied. Half of the injected proteins were present in the liver 7 and 12 hr after the injection. The inhibition of acid α-glucosidase never exceeded 40%, and the glucogen content did not differ significantly from control values. Electron microscopic studies showed that 7 hr after injection the Kupffer cells were swollen by large vacuoles containing electron-lucent spaces, lipid debris and, more rarely, multilamellar structures. Modifications in the parenchymal cells were more discrete, the general appearance of these cells being normal except for the presence of multilamellar concentric structures in the lysosomal apparatus. These structures appeared to be almost intact liposomes.

8223 MOUSE MODEL FOR PROTOPORPHYRIA. I. THE LIVER AND HEPATIC PROTOPORPHYRIN CRYSTALS. *(E.)* Gschnait, F.; Konrad, K.; Honigsmann, H.; Denk, H.; Wolff, K. (Div. Experimental Dermatology, Univ. Vienna, Vienna, Austria). *J. Invest. Dermatol.* 65(3):290-299, 1975.

Livers from outbred albino mice fed a diet containing 2.5% (weight) griseofulvin for 1 to 175 days were examined for the presence of protoporphyrin (PP), the morphologic changes induced by the drug, and the nature of intrahepatic PP crystals. RBC-PP values were also determined. Liver PP and RBC-PP values were elevated on the fifth day of griseofulvin treatment and continuously increased thereafter. The livers enlarged significantly within three to four wk and, after three months, weighed up to five times more than the livers of untreated controls. Brown pigment granules were found in the cytoplasm of liver cells and in bile canaliculi as early as 48 hr after griseofulvin treatment, and after five days the granules were present in activated Kupffer cells, portal macrophages, and bile ducts. Changes reminiscent of cholestatic liver damage were apparent after two wk of griseofulvin feeding, and irregular cirrhosis was noted after 145 days. The granules showed red fluorescence, birefringence, and, at the ultrastructural level, consisted of aggregates of needle-like crystals. Crystals isolated from such livers had the solubility and absorption characteristics of PP; *in vitro* recrystallization of the PP extracted from protoporphyric mouse livers yielded crystals identical to those observed *in vivo*. Commercial PP exhibited similar morphologic features. The liver pathology and PP crystals observed in these animals are identical to the liver pathology and crystals found in human erythropoietic protoporphyria. In this mouse model, PP crystals are intimately associated with hepatocellular injury and their accumulation within hepatocytes appears to lead to hepatocellular destruction. A similar pathogenesis is postulated for the hepatic damage that occurs in some cases of erythropoietic protoporphyria.

8224 COPPER-BINDING PROTEINS IN THE NEONATAL AND ADULT RAT LIVER SOLUBLE FRACTION. *(E.)* Evans, G. W.; Wolenetz, M. L.; Grace, C. I. (Human Nutrition Lab., Grand Forks, N. D. 58201). *Nutr. Rep. Int.* 12(4):261-269, 1975.

Copper-binding proteins were isolated from the soluble fractions of neonatal Wistar rat liver and of liver from three adult rats injected with 200 μg Cu^{2+} daily for three days. In both preparations, copper was eluted from Sephadex G-75 in four distinct fractions, and that portion which eluted ahead of the total volume was purified further on Sephadex G-50. The elution volume of this copper-containing fraction was identical to that of the cadmium-binding protein obtained from the liver of cadmium-loaded rats. Electrophoresis indicated that the migration distance of each of the protein preparations was identical to that of serum albumin. The amino acid composition of the copper-binding protein from neonatal rat liver was very similar to that of metallothionein, while the amino acid composition of the protein from copper-injected rats differed from that of metallothionein. The protein isolated from neonatal liver and from cadmium-loaded rats contained 20 to 24% cysteine, but the protein from copper-loaded rats contained only 5% cysteine. The neonatal protein contained more zinc than copper, while the protein from the copper-injected rats contained more copper than zinc. The cadmium-binding protein contained no detectable copper. The results indicate that two distinct proteins are involved in hepatic copper binding under physiologic and pathologic conditions.

8225 ADENINE NUCLEOTIDE CONTENT OF HUMAN LIVER. NORMAL VALUES AND FRUCTOSE-INDUCED DEPLETION. *(E.)* Hultman, E.; Nilsson, L. H.; Sahlin, K. (Dept. Clinical Chemistry, Beckomberga sjukhus, S-161 04 Bromma 4, Stockholm, Sweden). *Scand. J. Gastroenterol.* 35(3):245-251, 1975.

A special sampling technique for the determination of metabolites in human liver samples *in vivo* is described and normal values of ATP, ADP, AMP, pyruvate and lactate in human liver are presented. Percutaneous biopsies taken from 12 healthy subjects (8 men and 4 women, aged 21-40 yr) were frozen by plunging the needle in liquid freon (-150 C). The mean sampling time was 2.0 sec; in three samples, the freezing was delayed by 5.0 sec. The normal values of ATP, ADP, AMP, pyruvate and lactate determined from the liver samples of healthy subjects were: 8.23 ± 1.96 mM/kg, 3.80 ± 0.61 mM/kg, 0.88 ± 0.60 mM/kg, 1.20 ± 0.58 mM/kg and 2.7 ± 1 to 4.6 mM/kg, resp. Infusion of D-fructose (5.9 mM/kg/hr for 70 min) resulted in a 22.5% decrease of the adenine nucleotide pool (mainly ATP depletion); it increased content of fructose 1-phosphate, lactate, and pyruvate. The extent of adenine nucleotide depletion varied greatly between subjects and appeared to be related to the increase of plasma urate. This finding supports the hypothesis that increases in plasma urate during fructose infusion originate from enhanced adenine nucleotide breakdown. Infusion of glucose at the same rate did not affect the hepatic content of adenine nucleotides. No significant changes in the adenine nucleotides were detected when the sampling period was extended by 5 sec. Thus, it is concluded that the values obtained with this method reflect the *in vivo* adenine nucleotide contents.

8226 COMPARISON OF RAT HEPATIC MICROSOMAL MIXED-FUNCTION OXIDASE ACTIVITES IN MICROSOMAL PREPARATIONS, ISOLATED HEPATOCYTES AND LIVER SLICES. *(E.)* Gerayesh-Nejad, S.; Jones, R. S.; Parke, D. V. (Dep. Biochem., Univ. Surrey, Guildford, England). *Biochem. Soc. Trans.* 3(3):403-405, 1975.

To determine the importance of cellular integrity in hepatic drug metabolism, various model enzyme systems (benzo[*a*]pyrene hydroxylase, biphenyl 4-hydroxylase, thiabendazole hydroxylase, and ethylmorphine *N*-demethylase) were studied in liver microsomal preparations, isolated hepatocytes, and liver slices from male Wistar rats. With the exception of biphenyl hydroxylase, maximum enzyme activities were observed in the microsomal preparations, followed by the liver slices and the hepatocytes. Biphenyl hydroxylase activity was greatest in hepatocytes, followed by the microsomal preparations and slices. In the microsomal preparations and hepatocytes, maximum enzyme activity was observed within the first 5 min. In contrast, with the exception of ethylmorphine *N*-demethylase, maximum enzyme activity in the slices was generally observed after intervals greater than 5 min. Biphenyl 4-hydroxylase activity in the hepatocytes was lost more rapidly than the activity in the other preparations; this may have been due to a loss of cofactors into the incubation media in addition to enzyme degradation. The data appear to refute the hypothesis that cellular integrity is necessary for optimum hepatic metabolic rates.

8227 ON HISTOCHEMICAL ENZYME CHANGES IN ASSOCIATION WITH CANALICULAR ACTIVITY OF ALKALINE PHOSPHATASE IN HUMAN LIVER. *(E.)* Hagerstrand, I. (Malmo General Hosp., 21401, Malmo S, Sweden). *Acta Pathol. Microbiol. Scand.* [*A*] 83(5):527-533, 1975.

Fifty-six liver biopsy specimens with insignificant or no histologic changes but with extensive canalicular alkaline phosphatase activity were studied histochemically for other enzyme changes. In comparison with normal specimens, 22 of the 53 specimens showed more extensive and increased canalicular activity of gamma-glutamyl transferase. In 12 of 49 specimens, leucyl aminopeptidase activity was increased in canaliculi but markedly decreased in sinusoids. Staining for adenosine triphosphatase regularly disclosed a normal pattern of sinusoidal and canalicular activity. In 20 of 31 specimens, the activity of beta-glucuronidase, a lysosomal enzyme, was clearly increased in the cytoplasm and in hepatocytes of the pericanalicular region. A similar pattern of activity was observed in 26 of 39 specimens stained for the lysosomal enzyme acid phosphatase. Enzymes present in the cytosol (LDH), in the mitochondria (succinic dehydrogenase, monoamine oxidase), and in the endoplasmic reticulum (glucose-6-phosphatase) showed normal staining patterns. It is concluded that the previously observed canalicular alkaline phosphatase activity represents a true increase in enzyme activity, which is apparently connected with the induction of the hydroxylating system of smooth endoplasmic reticulum.

8228 A COMPARISON OF CANINE NORMAL HEPATIC ALKALINE PHOSPHATASE AND VARIANT ALKALINE PHOSPHATASES OF SERUM AND LIVER. *(E.)* Hoffmann, W. E.; Dorner, J. L. (Coll. Veterinary Medicine, Univ. Illinois, Urbana, Ill. 61801). *Clin. Chim. Acta* 62(1):137-142, 1975.

A study was conducted to confirm the source of the corticosteroid-induced isoenzyme of serum (SAP-CS) as being the corticosteroid-induced liver enzyme, alkaline phosphatase (LAP-CS), as well as to confirm the fact that the variant liver alkaline phosphatase produced in lymphosarcoma (LAP-L) was identical to the enzyme LAP-CS. Serum and liver samples were obtained from seven dogs: one with a hyperactive adrenal cortex, one with advanced lymphosarcoma, and the remaining were five normal dogs. Twenty-five liver samples were subjected to butanol extraction and serum was diluted 1:1 with saline. Isoenzymes from both liver and serum were precipitated by ethanol fractionation and were subjected to cellulose acetate electrophoresis. The Michaelis constant for nitrophenol phosphate of each isoenzyme was determined using a double-reciprocal plot. Heat stability at 56 C, as well as inhibitory effects of L-glycine, L-phenylalanine and L-leucine from concentrations of 0.001 to 0.1 M were determined. The normal hepatic isoenzyme (LAP-N) precipitated in between 33 to 50% ethanol concentration, whereas LAP-CS and LAP-L precipitated in between 54 to 67% ethanol concentration. The pH optimum for LAP-N was 10.2 and that of SAP-CS, LAP-L and LAP-CS was 9.7. The Michaelis constants for LAP-N, LAP-CS, LAP-L and SAP-CS were 0.87, 1.45, 1.49, and 1.48, resp. The isoenzymes LAP-CS, LAP-L and SAP-CS had the same heat stability and were more stable than LAP-N. The enzymes LAP-L, LAP-CS and SAP-CS were not inhibited by glycine unless concentrations exceeded 0.05 M. At concentrations of 0.01, 0.05 and 0.1 M phenylalanine inhibited LAP-N considerably less than the other three enzymes. Inhibition by L-leucine was identical for all four enzymes. It was concluded that SAP-CS, LAP-CS and LAP-L were identical enzymes and that they were not steroid-induced, but were distinctly different from the normal hepatic enzyme.

8229 HEPATIC ALBUMIN AND UREA SYNTHESIS: THE MATHEMATICAL MODELLING OF THE DYNAMICS OF (^{14}C)CARBONATE-DERIVED GUANIDINE-LABELLED ARGININE IN THE ISOLATED PERFUSED RAT LIVER. *(E.)* Tavill, A. S.; Nadkarni, D.; Metcalfe, J.; Black, E.; Hoffenberg, R.; Carson, E. R. (M.R.C. Clinical Res. Center, Harrow, Middlesex HA1 3UJ, England). *Biochem. J.* 150(3):495-509, 1975.

A mathematical model was constructed to define the dynamics of incorporation of radioactivity into urea carbon and the guanidine carbon of arginine in the plasma albumin after the rapid intraportal-venous administration of $Na_2{}^{14}CO_3$ in the isolated perfused rat liver. The model was formulated in terms of compartmental analysis and additional experiments were designed to provide further information on subsystem dynamics and to discriminate between alternative model structures. Evidence for the rapid time-constants of labeling of intracellular arginine was provided by a precursor-product analysis of precursor (^{14}C)carbonate and product (^{14}C)urea in the perfusate. Compartmental analysis of the dynamics of newly synthesized urea was based on the fate of exogenous (^{13}C)urea, endogenous (^{14}C)urea, and the accumulation of (^{12}C)urea in perfusate water, confirming the early completion of urea carbon labeling, the absence of continuing synthesis of labeled urea, and the presence of a small intrahepatic urea-delay pool. Analysis of the perfusate dynamics of endogenously synthesized and exogenously administered (6-^{14}C)arginine indicated that although the capacity for the extrahepatic formation of (^{14}C)urea existed, little or no arginine formed within the intrahepatic urea cycle was transported out of the liver. However, the presence of a rapidly turning-over intrahepatic arginine pool was confirmed. On the basis of of these subsystem analyses, it was possible to offer feasible estimations of the parameters of the mathematical model. However, it was not possible to simulate the form and magnitude of the dynamics of newly synthesized labeled urea and albumin, which were observed simultaneously after the administration of (^{14}C)carbonate, on the basis of a preliminary model which postulated that both products were derived from a single hepatic pool of (6-^{14}C)arginine. These observed dynamics could be satisfied by a two-compartment arginine model, which also provided an explanation of discrepancies observed beween albumin synthesis measured radioisotopically and immunologically. This was based on a relative overestimation of (^{14}C)urea specific radioactivity resulting from the rapid dynamics of (^{14}C)-carbonate and the (^{14}C)urea subsystem relative to the labeled albumin subsystem. The effects of arginine compartmentalization could be minimized in the model by minor slowing of the rate of (^{14}C)carbonate turnover or by constant infusion of (^{14}C)carbonate, both of which permitted valid determinations of the albumin systhesis rates.

8230 SYNTHESIS OF PLASMA HAEMOPEXIN, ALBUMIN AND FIBRINOGEN BY THE REGENERATING RAT LIVER. *(E.)* Murray-Lyon, I. M.; Liem, H. H.; Eberhard-Müller, U. (Scripps Clinic and Res. Foundation, La Jolla, Calif. 92037). *Br. J. Exp. Pathol.* 56(3):247-255, 1975.

The incorporation of [^{3}H]-L-leucine into plasma hemopexin, albumin, and fibrinogen was used to study the synthesis of these compounds in the rat. The production of hemopexin, albumin, and fibrinogen by the isolated perfused male Sprague-Dawley rat liver was also determined at various intervals following laparotomy and partial hepatectomy. In the first study, [^{3}H]-L-leucine (100 μCi/100 g) was injected into the tail vein 4 to 48 hr after surgery and its incorporation into hemopexin, albumin, and fibrinogen was determined 60 min later. The mean plasma hemopexin levels were significantly higher 24 and 48 hr after laparotomy than at similar intervals after hepatectomy, while the levels 24 and 48 hr after hepatectomy were significantly higher than at 4 hr and significantly higher than in the unoperated controls. At all intervals after hepatectomy and laparotomy, the incorporation of isotope into plasma hemopexin was greater than in the controls, the greatest values being observed at 24 hr; the increase was always greater after hepatectomy than after laparotomy. Similar results were found regarding fibrinogen concentration and synthesis, whereas the plasma albumin concentration at 24 and 48 hr was significantly reduced in both the hepatectomy and laparotomy groups, and there was no statistically significant increase in isotope incorporation into albumin during the 48 hr after partial hepatectomy. A short but significant increase in isotope incorporation into albumin was observed in the laparotomy group four hr after surgery. The mean plasma protein concentration was significantly reduced at each time interval following hepatectomy, but was unchanged following laparotomy. Isotope incorporation into total plasma protein was significantly increased in the hepatectomized group compared with the laparotomized group, and was significantly increased in the laparotomized group at 4 and 24 hr compared with the control group. Hemopexin and albumin production were increased after hepatectomy in the liver perfusion studies, whereas only hemopexin production was increased after laparotomy. The ratio between the production of albumin and the production of hemopexin was significantly higher in the controls than in the laparotomy group. No significant change in hematocrit was observed in any group. It appears that, unlike serum albumin synthesis, there is a high priority for hemopexin and fibrinogen synthesis after partial hepatectomy and laparotomy.

8231 INHIBITION BY COLCHICINE OF FIBRINOGEN TRANSLOCATION IN HEPATOCYTES. *(E.)*

Feldmann, G.; Maurice, M.; Sapin, C.; Benhamou, J. P. (Hopital Beaujon, 92110 Clichy, France). *J. Cell Biol.* 67(1):237-243, 1975.

The presence of fibrinogen in hepatocytes of adult male rats injected i.p. with colchicine (2.5 mg/kg) was studied by means of antirat fibrinogen antibodies labeled with peroxidase. Under the light microscope, numerous fibrinogen-containing hepatocytes were detectable in the vicinity of the portal triad eight hr after colchicine administration. The reaction was less intense at 16 hr and by 32 hr only a few hepatocytes contained fibrinogen. By electron microscopy, fibrinogen was found to be abundant in the lumina of the rough endoplasmic reticulum at eight hr after colchicine injection. At 16 hr, fibrinogen was abundant in the lumina of the smooth endoplasmic reticulum and was present in small amounts in the lumina of the rough endoplasmic reticulum. At 24 hr, fibrinogen was not present in the lumina of the rough endoplasmic reticulum, was detectable in small amounts in the lumina of the smooth endoplasmic reticulum, and was abundant in the lumina of the Golgi apparatus. Microtubules were almost completely lacking in the cytoplasm of hepatocytes of colchicine-treated animals. The effect of colchicine on the cytoplasmic translocation of fibrinogen could be due to a direct action of the drug on the membranes of the endoplasmic reticulum or could be the indirect result of the disruptive action of the drug on the microtubules.

8232 BILE SALT METABOLISM IN THE HUMAN PREMATURE INFANT: PRELIMINARY OBSERVATIONS OF POOL SIZE AND SYNTHESIS RATE FOLLOWING PRENATAL ADMINISTRATION OF DEXAMETHASONE AND PHENOBARBITAL.

(E.) Watkins, J. B.; Szczepanik, P.; Gould, J. B.; Klein, P.; Lester, R. (Children's Hosp. Medical Center, Boston, Mass.). *Gastroenterology* 69(3): 706-713, 1975.

Bile salt synthesis and bile salt pool size were determined in nine healthy premature infants (32-36 weeks gestation), four of whose mothers had received dexamethasone or phenobarbital prior to delivery. Tetra-deuterated cholic acid (5 mg) and chenodeoxycholic acid (3 mg) were administered by nasogastric tube to 3 to 11-day-old infants. Duodenal fluid (1-5 ml) was obtained through an infant feeding tube 30 to 90 min after the start of feeding. Bile salt synthesis and bile salt pool size were determined by isotope dilution. The total bile salt pool was 19.5 mg in the children of the untreated mothers and 79.3 mg in the infants of the drug-treated mothers. The bile salt synthesis rate in the untreated group was 8.2 mg/day, compared to 26.7 mg/day in the drug-treated group. The cholic acid pool in the treated group was 321 mg/sq m of body surface and the cholic acid synthesis rate was 98 mg/sq m/day. These values were similar to those in full-term infants and nearly three times greater than those in the untreated group. The intraduodenal bile salt concentrations obtained during meals was also low in the untreated group (1.2 mM) as compared with the treated group (5.3 mM). The data indicate that the functional maturity of the liver, and possibly that of the gastrointestinal tract, is reduced in premature infants. They also suggest that this maturity may be dramatically influenced by medications administered to the mother prior to delivery.

8233 BARBITURATES AND BILIARY FUNCTION. *(E.)*

Capron, J. P.; Erlinger, S. (Hopital Beaujon, Clichy, France). *Digestion* 12(1):43-56, 1975.

The literature concerning the principal effects of phenobarbital on biliary function is reviewed. When administered for 3 to 15 days, phenobarbital increases bile flow in the rat and in the rhesus monkey; after a single injection of 80 mg/kg, the increase in bile flow is detectable after six hr and is maximal after 14 hr. Administration of phenobarbital for a longer time (seven days in the rat, 15 in the rhesus monkey) is followed by an increase in both bile salt-independent bile flow and bile salt excretion. In man, phenobarbital (180 mg/day for 4-7 days) may increase the bile salt-independent flow. The effect of phenobarbital on bile flow is due mainly to an increase in the canalicular bile salt-independent bile flow and may involve an increase in canalicular Na^+-K^+ ATPase activity. The phenobarbital-induced increase in bile flow appears to be unrelated to the effects of barbiturates on microsomal enzyme induction. Phenobarbital also increases the uptake, storage, and excretion of various dyes (e.g., BSP and indocyanine green) used to study hepatobiliary function. In addition to enhancing hepatic clearance in bilirubin in the rat and the rabbit, phenobarbital increases liver bilirubin-uridine diphosphate-glucuronyl transferase activity in animals and man. The biliary excretion of a number of exogenous compounds (e.g., chlorothiazide, ouabain, benzpyrene) and of some endogenous compounds (e.g., thyroxin, vitamin D) is increased by phenobarbital. The influence of phenobarbital on biliary lipids differs markedly from one species to another: after phenobarbital treatment, the relative cholesterol concentration decreases in the rhesus monkey and the rat, increases in the hamster, and remains largely unaffected in man. These effects of phenobarbital have been utilized in the treatment of chronic unconjugated hyperbilirubinemia, Gilbert's syndrome, the Dubin-Johnson syndrome, and some cholestatic syndromes. Although phenobarbital may decrease cholesterol saturation of the bile, the drug has not been successful in the treatment of cholesterol gallstones.

8234 PRODUCTION OF FERRITIN BY RAT HEPATOMA CELLS IN VITRO. *(E.)* Lee, J. C. K.; Lee, S. S. C.; Schlesinger, K. J.; Richter, G. W. (Univ. Rochester Sch. Medicine and Dentistry, Rochester, N. Y. 14642). *Am. J. Pathol.* 80(2):235-248, 1975.

The distribution of protein subunit-positive and ferritin-positive sites and the sequence of events in the formation of ferritin molecules was studied. Immunodiffusion, immunoelectrophoresis, disc electrophoresis and immunofluorescent staining were used to evaluate Reuber H-35 and H-139 hepatoma cells and Morris 5123 (M-5123) hepatoma cells. The hepatomas had originally been passaged in rats; they were explanted, propagated, and grown in ordinary Mc Coy's 5a medium or in medium enriched with iron (0.002% Fe). The cells were then treated with rabbit antibodies specific for either the protein subunits of ferritin or ferritin, 0.9% aqueous NaCl, serum from unimmunized goats, phosphate-buffered saline, immunoglobulin from unimmunized rabbits, or sera from unimmunized rabbits. Explants from each type of hepatoma gave rise to at least two cell populations: hepatoma cells and fibroblast-like cells. The hepatoma cells and fibroblasts from each tumor type grown in ordinary or iron-enriched medium gave specific immunofluorescence for subunits and ferritin. Subunit-specific immunofluorescence was evident in 80 to 90% of the hepatoma cells of the Morris 5123 cell clone; this immunofluorescence did not increase after iron-treatment. However, the exposure of a clonal strain of Morris 5123 hepatoma cells to iron-enriched culture medium resulted in a progressive increase in the quantity of ferritin-specific immunofluorescence; this immunofluorescence was diffuse at first and later appeared in clumps. Specific immunofluorescent staining was also seen in the nuclei of hepatoma cells treated with serum IgG from a rabbit treated with complete Freund's adjuvant and 0.9% aqueous NaCl. The positive intranuclear immunofluorescence was abolished after absorption of subunit-directed IgG with preparations of nuclei from the livers or kidneys of ACI rats. Specific antibodies to IgG from rabbits immunized with protein subunits of ACI rat liver ferritin did not produce intranuclear immunofluorescence. The data indicate the presence, in the cytoplasm of the cells studied, of unassembled or only partly assembled subunits or fragments of subunits as well as ferritin. They also indicate the rapid assembly of the protein subunits into apoferritin and ferritin after the administration of iron, with no significant change in the concentration of subunits in the cytoplasm.

8235 THE INTERACTION OF VARIOUS CONTROL MECHANISMS IN DETERMINING THE RATE OF HEPATIC CHOLESTEROGENESIS IN THE RAT. *(E.)* Weis, H. J.; Dietschy, J. M. (Medizinische Klinik, Johannes Gutenberg-Universität, Mainz, Germany). *Biochim. Biophys. Acta* 398(2):315-324, 1975.

The rate of hepatic cholesterogenesis was studied in female Sprague-Dawley rats following the superimposition of different light cycles and stress on a background of altered synthetic activity. The altered activity was caused by feeding cholesterol (0.1 g/100 g of diet), cholestyramine resin (2 g/100 g of diet), or β-sitosterol (7 g/100 g of diet), or by fasting. The animals were simultaneously subjected to diurnal light-cycling for varying periods of time and, in some cases, were placed in restraining cages for 48 hr prior to killing. In control animals exposed to light cycling for two wk, the rate of hepatic cholesterogenesis was 3.7-fold higher in the mid-dark than in the mid-light phase of the cycle. The magnitude of this difference varied with the duration of light cycling and with the size of the animal. Similarly, enhanced rates of cholesterol synthesis were seen in the mid-dark phase relative to the mid-light phase of the light cycle in rats in which the baseline level of hepatic cholesterogenesis was increased by feeding cholestyramine (1.6-fold) or β-sitosterol (2.9-fold) or was depressed by fasting (19-fold) or by cholesterol feeding (2.1-fold). Restraining the animals for 48 hr also increased the rate of hepatic cholesterol synthesis; in control animals, this stress enhanced the level of cholesterogenesis seen at both the mid-light and mid-dark phases of the light cycle. In addition, the effects of stress and diurnal cycling could be identified in groups of animals in which the base-line cholesterogenic activity was changed by fasting or by feeding cholestyramine, β-sitosterol, or cholesterol. The data illustrate the complexity of the mechanism controlling hepatic cholesterol synthesis and suggest that the final rate of cholesterogenesis may be the result of several different effectors modifying by different mechanisms the activity of β-hydroxy-β-methylglutaryl-CoA reductase.

8236 STEROID OXIDOREDUCTASE ACTIVITY OF ALCOHOL DEHYDROGENASES FROM HORSE, RAT, AND HUMAN LIVER. *(E.)* Cronholm, T.; Larsen, C.; Sjovall, J.; Theorell, H.; Akeson, A. (Kemiska institutionen, Karolinska instituet, S-104 01 Stockholm, Sweden). *Acta Chem. Scand.* [*B*] 29(5): 571-576, 1975.

The steroid activity of alcohol dehydrogenases from horse liver was investigated by determining the rate of formation of reduced nicotinamide adenine dinucleotide (NADH) in incubations of the alcohol dehydrogenase isoenzymes (EE, ES, and SS) with 18 3-hydroxysteroids. The NAD concentration of the reaction mixtures was 0.5 mM. Alcohol dehydrogenases from rat and human liver were tested for rates of NAD formation with 3β-hydroxy-5β-cholanoate and 17β-hydroxy-5β-andostan-3-one. Isoenzymes SS and ES (but not EE) from horse liver, as well as the rat and human liver enzymes, catalyzed the NAD-dependent oxidation of 3β-hydroxy groups in 5α- and 5β-steroids of the C_{19}, C_{21}, and C_{24} series. The enzymes from horse and rat liver were more active on 5β- than on 5α-steroids. This difference was most marked with the enzyme from rat liver, especially with 3β-hydroxyandrostan-17-ones and 3β-hydroxypregnan-20-ones as substrates. The K_m of isoenzyme ES from horse liver was lower for 3β-hydroxy-5α-cholanoic acid (0.4 μM) than for 3β-hydroxy-5β-cholanoic acid (0.9 μM). Human liver alcohol dehydrogenase had low affinity for 3β-hydroxy-5α (and 5β)-cholanoic acids, but oxidation could be clearly demonstrated by gas chromatographic analysis of the products.

8237 TURNOVER OF PALMITOYLCARNITINE IN RAT LIVER. *(E.)* Akesson, B. (Dept. Physiological Chemistry, Univ. Lund, Lund, Sweden). *Biochim. Biophys. Acta* 393(3):485-489, 1975.

The metabolism of palmitoylcarnitine *in vivo* was studied in fed male rats injected intraportally with 0.25 ml of a solution containing 12 mg albumin and 60 μCi (9,10-$^3H_2$)palmitic acid. At various intervals thereafter, the liver lipids were extracted and palmitoylcarnitine was isolated from the lipids by thin-layer chromatography. The radioactivity in palmitoylcarnitine was maximal within the first five sec after injection of [^{3}H]palmitic acid, concomitant with the rapid elimination of isotope from the free fatty acids. The isotope was then rapidly eliminated from the palmitoylcarnitine. During the first six sec, six to ten times more palmitic acid was incorporated into glycerolipids than was directed into palmitoylcarnitine, the ratio of palmitoylcarnitine synthesis to phosphatidic acid synthesis up to six sec after injection ranging between 0.10 and 0.44. Using these figures, the rate of palmitoylcarnitine synthesis was calculated to be 0.49 μM palmitic acid/min/10 g of liver. The fractional turnover of this compound was estimated to be 13.2 min^{-1}. The data are consistent with the view that acylcarnitines are transiently formed when acyl residues are transported into the mitochondria.

8238 PENTOBARBITAL PHARMACOKINETICS IN THE NORMAL AND IN THE HEPATECTOMIZED RAT. *(E.)* Ossenberg, F. W.; Peignoux, M.; Bourdiau, D.; Benhamou, J. P. (Hosp. Beaujon, 92110 Clichy, France). *J. Pharmacol. Exp. Ther.* 194(1):111-116, 1975.

The pharmacokinetics of pentobarbital, a barbiturate metabolized by the liver, was compared in ten normal and ten hepatectomized adult male Charles River rats immediately after hepatectomy. A mixture of 20 mg/kg of sodium pentobarbital and 4 μCi/kg of [2-^{14}C]-pentobarbital was injected into the jugular vein. Blood samples were taken from the carotid artery 1 to 210 min afterward and the pentobarbital blood concentration at each interval was determined. Pentobarbital excretion in the bile and urine was determined in five of the normal rats; the drug concentration in the liver, kidney, lung, brain, ileum, spleen, lumbodorsal fat, skin, abdominal muscle, and blood was determined one and ten min after injection in four normal rats. The blood concentration time curve after i.v. pentobarbital was fitted into a two-compartment open model. Both the volume of the central compartment and the elimination rate constant were significantly reduced in the hepatectomized animals. The amounts of pentobarbital and its metabolites excreted into the bile and urine during the first four hr after i.v. injection were 1.5% and 26.1%, resp. Unchanged pentobarbital constituted 10.3% of the total drug in the bile and none of the drug in the urine. In the liver, kidney, spleen, brain, and intestine, the pentobarbital concentrations were higher than in the blood and were higher after one min than after ten min. In the fat, skin, and muscle, the pentobarbital concentrations were lower than those in the blood at one min, and were higher at ten min than at one min. Most of the drug present in the tissues ten min after injection was unchanged pentobarbital. The results indicate that pentobarbital is metabolized almost exclusively by the liver and that the urine contains only pentobarbital metabolites; the amount of drug excreted in the bile is very small.

8239 STUDY OF THE HEPATIC METABOLISM OF PRIMIDONE BY IMPROVED METHODOLOGY. *(E.)* Alvin, J.; Goh, E.; Bush, M. T. (Vanderbilt Univ. Sch. Medicine, Nashville, Tenn. 37232). *J. Pharmacol. Exp. Ther.* 194(1):117-125, 1975.

The metabolism of the anticonvulsant drug, primidone (PRM), in isolated perfused rat liver was studied by radiotracer methodology which permits nearly quantitative determination of the dose and its metabolites. Groups of four male Sprague-Dawley rats were pretreated with daily doses (50 mg/kg, i.p.) of PRM or phenobarbital for four days. Two untreated rats served as controls. Livers were perfused with a blood-free medium containing Krebs-Ringer bicarbonate buffer, glucose, and bovine serum albumin. After 20 min of perfusion, [^{14}C]PRM was added to an initial concentration of 50 µg/ml; in most cases, unlabeled phenobarbital or phenylethylmalonamide (50 µg/ml) was added to the perfusate midway through the perfusion. Every 15 min, samples of the perfusate, the biliary output, and the liver were analyzed for PRM and its metabolites. Identification of ^{14}C-material was based on comparisons of thin-layer chromatography and countercurrent distribution and was quantitated by liquid-scintillation counting. Phenylethylmalonamide was the predominant metabolite of PRM (79%) in the livers of the nonpretreated rats; phenobarbital and its metabolites accounted for 18% of the PRM metabolized, and an unidentified metabolite accounted for 3%. PRM and phenobarbital pretreatment, particularly with the latter, accelerated PRM metabolism by the perfused livers. The $T_{1/2}$ values in the control, PRM-, and phenobarbital-pretreated groups were 92, 68, and 28 min, resp. The primary metabolite was phenylethylmalonamide, but phenobarbital production also increased proportionately. The introduction of nonlabeled phenylethylmalonamide to the perfusate produced an immediate reduction in the rate of PRM metabolism in all groups; addition of nonlabeled phenobarbital had no effect. It is concluded that the conversion of PRM to its active metabolites may be simultaneously influenced by the processes of metabolite inhibition (phenobarbital) and metabolite induction (phenylethylmalonamide).

8240 THE ROLE OF PLASMA AMINO ACIDS IN HEPATIC ENCEPHALOPATHY. *(E.)*

Fischer, J. E.; Funovics, J. M.; Aguirre, A.; James, J. H.; Keane, J. M.; Wesdorp, R. I. C.; Yoshimura, N.; Westman, T. (Massachusetts General Hosp., Boston, Mass. 02114). *Surgery* 78(3):276-290, 1975.

An end-to-side portacaval shunt was performed on dogs to simulate the amino acid patterns of humans with chronic liver disease. A mixture of various amino acids was designed to normalize plasma amino acids in the hepatic encephalopathy, which resulted from the operation. The shunt was performed behind the highest branch of the portal vein. After surgery, the dogs were divided into three groups, and infusion with amino acid mixture was begun when the animals manifested encephalopathy. The dogs had lost an average of 12.4% of their initial body weight at this time. Group 1 was infused with isocaloric amounts of 23% dextrose, electrolytes and homologous dog plasma. Group 2 was infused with a commercially available solution of synthetic amino acid (nitrogen level was maintained to about 4 g protein/kg/day). Group 3 was infused with an isocaloric and isonitrogenous amount of a special formula (F080) mixed to normalize plasma amino acid levels. Two of the five dogs in group 1 died in typical hepatic encephalopathy. In group 2, all three of the animals died within five to 18 days. All of the dogs of group 3 that were originally in hepatic encephalopathy showed neurological improvement within 24 hr. All dogs of group 1 continued to lose weight and manifested a nitrogen balance of -2.2 g over 24 hr. Groups 2 and 3 showed no further weight loss, and their mean nitrogen balance was +3.4 g/24 hr and +3.2 g/24 hr, resp. No gross distortion in electrolyte balance was observed in any of the groups. Blood urea nitrogen was slightly higher in groups 2 and 3, and blood sugar was the highest in group 1. Serum ammonia rose in all animals after the operation and remained elevated until they were placed on total parenteral nutrition. Following the operation, plasma phenylalanine, tyrosine, tryptophan, and methionine were characteristically elevated and branched chain amino acids were decreased in dogs that developed encephalopathy. These patterns were not altered when infusion was begun in the first two groups, but were altered in group 3. Phenylalanine, tyrosine, and tryptophan returned toward normal, and leucine, isoleucine, and valine levels increased. The results suggest that normalization of plasma amino acids may be of value in controlling hepatic encephalopathy in animals and may lead to a better understanding of the mechanism of human hepatic encephalopathy.

8241 HEPATIC MICROSOMAL ETHANOL-OXIDIZING SYSTEM (MEOS): DISSOCIATION FROM REDUCED NICOTINAMIDE ADENINE DINUCLEOTIDE PHOSPHATE OXIDASE AND POSSIBLE ROLE OF FORM I OF CYTOCHROME P-450. *(E.)*

Hasumura, Y.; Teschke, R.; Lieber, C. S. (Veterans Admin. Hosp., Bronx, New York, N. Y.). *J. Pharmacol. Exp. Ther.* 194(2):469-474, 1975.

The activities of the liver microsomal ethanol-oxidizing system (MEOS) and NADPH oxidase in female Sprague-Dawley rats were compared before and after treatment with ethanol, phenobarbital and CCl_4. The relation between MEOS activity and the content of three forms of cytochrome P-450 was also assessed. Chronic ethanol feeding to rats (a 4-5-week liquid diet containing ethanol, 36% of total calories) increased MEOS and NADPH oxidase activities by 102 and 62%, resp. Concomitantly, form I of cytochrome P-450 was increased by 88%. Acute administration of ethanol (withdrawal of chronic alcohol diet followed by 7.5 g/kg ethanol, intragastrically, for 6 hr) enhanced MEOS activity by 21% and form I of cytochrome P-450 by 20%. It had no effect on NADPH oxidase activity. Pretreatment of rats with phenobarbital (80 mg/kg, i.p. daily for 4 days) increased the specific activity of NADPH oxidase by 40%; MEOS activity remained unchanged. Administration of CCl_4 (0.5 ml/kg p.o.) did not change NADPH oxidase activity but reduced MEOS activity by 33%. It significantly decreased all three forms of cytochrome P-450: form I by 45%, form II by 56%, and form III by 24%. These results suggest that in the presence of NADPH, microsomes oxidize ethanol to acetaldehyde by a process involving form I of cytochrome P-450. Peroxide formation due to NADPH oxidase is not the rate-limiting step.

8242 BIOSYNTHESIS OF ACYL GROUPS IN MOLECULAR SPECIES OF BILIARY PHOSPHATIDYLCHOLINES DURING METABOLISM OF [2,2,2-$^2H_3$]ETHANOL. *(E.)*

Curstedt, T. (Karolinska Inst., Stockholm, Sweden). *Biochim. Biophys. Acta.* 398(2):265-274, 1975.

The isotope content in different regions of the biliary phosphatidylcholine molecules and the isotopic composition of the 1-palmitoyl residues of different molecular species of phosphatidylcholines was measured following the i.p. injection of [2,2,2-$^2H_3$]ethanol into female bile fistula rats of the Sprague-Dawley strain. Beginning 48 hr after surgery, the ethanol was injected once every hr for 24 hr in volumes sufficient to maintain a biliary ethanol concentration of 10-30 mM. Bile was collected in 1 hr portions starting from the time of the first ethanol injection. The deuterium labeling of the glycerol moiety of the major molecular species (1 palmitoyl-2-oleoyl, 1-palmitoyl-2-linoleoyl, and 1-stearoyl-2-linoleoyl phosphatidylcholines) reached about 6-8 atom% after 24 hr of ethanol treatment. The deuterium excess at each of the different positions in the glycerol moiety of 1-palmitoyl-2-linoleoyl phosphatidylcholine was less than 3 atom%. The deuterium content in the palmitoyl residues of 1-palmitoyl-2-oleoyl and 1-palmitoyl-2-linoleoyl phosphatidylcholine increased during ethanol administration, as did the amount of deuterium in the palmitoyl residues of the 1-palmitoyl-2-arachidonoyl species. The deuterium excess of the steroyl residue of 1-steroyl-2-linoleoyl phosphatidylcholine was only 1/3 that of the palmitoyl residues, and no deuterium was found in the oleoyl residue of 1-palmitoyl-2-oleoyl phosphatidylcholine. From the isotopic composition of the palmitoyl residues of the phosphatidylcholines, it was estimated that the labeled ethanol supplied about 35-40% of the acetyl-CoA forming the terminal methyl group and about 25-30% of the other C_2 units of the palmitic acid chain. This difference in deuterium incorporation is attributed to an isotope effect, probably in the rate-limiting carboxylation step of acetyl-CoA. Most, if not all, of the acetyl groups derived from ethanol were introduced into the terminal methyl group without loss of deuterium. The results indicate that ethanol is a very important precursor of the acetyl-CoA used in lipid synthesis, and that citrate is not.

8243 ETHANOL INDUCED ALTERATION OF MICROSOMAL MEMBRANE BOUND ENZYMES OF RAT LIVER IN VITRO.

(E.) Marniemi, J.; Aitio, A.; Vainio, H. (Dep. Physiol., Univ. Turku, Finland). *Acta Pharmacol. Toxicol.* 37(3):222-232, 1975.

The effects of ethanol (0-4.90 mol/liter) on rat liver microsomal mono-oxygenase (*p*-nitroanisole O-demethylase and aryl hydrocarbon hydroxylase), UDP-glucuronosyltransferase (*p*-nitrophenol and 4-methylumbelliferone), and glucose 6-phosphatase activities were studied *in vitro* using the nontreated, trypsin-digested, and detergent-treated liver microsomes from normal, 3,4-benzpyrene- (20 mg/kg p.o. for 3 days), and phenobarbital- (80 mg/kg p.o. for 5 days) treated male Wistar rats. In the preparations from the untreated control rats, ethanol (0.34 mol/liter and above) inhibited *p*-nitroanisole O-demethylase and, to a lesser extent, aryl hydrocarbon hydroxylase. Inhibition, especially of aryl hydrocarbon hydroxylase, was less pronounced in microsomal preparations from the 3,4-benzpyrene-treated rats. In the untreated and detergent-treated microsomes from the control and drug-treated rats, ethanol (2.45 mol/liter) stimulated the activity of UDP-glucuronosyltransferase, while higher concentrations (4.90 mol/liter) of ethanol inhibited this enzyme. In trypsin-digested microsomes from control and 3,4-benzpyrene-treated animals, ethanol at 2.45 mol/liter did not inhibit glucuronidation of *p*-nitrophenol, but in the preparations from the phenobarbital-treated animals, ethanol at this concentration inhibited the activity by almost 50%. At concentrations of 4 mol/liter, ethanol inhibited the activity of glucose 6-phosphatase in the untreated microsomes from control and drug-treated rats. Trypsin and digitonin treatment increased the measurable enzyme activity to almost twice the original value, but cetylpyridinium chloride treatment slightly reduced the activity. Treatment of the microsomes with detergent or trypsin had no significant effect on the response of glucose 6-phosphatase to ethanol. The results suggest that the ethanol-sensitive component of the mono-oxygenase system is cytochrome P-450, that the activating effect of ethanol on UDP-glucuronosyltransferase is due to membrane perturbation, and that UDP-glucuronosyltransferase is deeply embedded behind a permeability barrier in the membrane compartment.

8244 EFFECTS OF ALCOHOL ON BILIARY LIPIDS IN THE PRESENCE OF A CHRONIC BILIARY FISTULA.

(E.) Marin, G. A.; Karjoo, M.; Ward, N.; Rosato, E. (Philadelphia Gen. Hosp., Pa.). *Surg. Gynecol. Obstet.* 141(3):352-356, 1975.

The effects of acute parenteral alcohol administration (1.5 g/kg in the first hr followed by 0.18 mg/kg/hr for the next 2 hr, perfused at a rate of 20 ml/hr) on the volume and composition of the bile was studied in chronic fistula mongrel dogs during partial interruption of the enterohepatic circulation of bile salts and during repletion of the enterohepatic circulation by continuous i.v. taurocholate sodium infusion (1.5 μM/kg/min). There was no evidence of intravascular hemolysis during these experiments. Alcohol administration was associated with a rise in the basal serum osmolality (from 295 mOsM/liter to 353 mOsM/liter), but with no change in the bile osmolality. The magnitude of interruption of the enterohepatic circulation increased with time, the overall interruption fluctuating between 25% and 50%. During alcohol administration, the blood and bile alcohol concentrations remained above 160 mg/ml throughout the experiment. Alcohol administration produced significantly decreased bile volume and total bile salt and cholesterol outputs; the phospholipid output was not affected. During continuous taurocholate infusion, alcohol failed to elicit changes in the biliary volume or in the output of bile salts. The decrease in cholesterol output, however, was not prevented by bile salt administration, and no significant changes occurred in the phospholipid output. Thus, alcohol causes significant changes in bile flow and biliary lipid composition. These findings are consistent with the existence of a bile salt-independent fraction of cholesterol secretion in the dog. The alcohol-stimulated fraction of bile formation was probably canalicular in origin.

8245 EFFECTS ON LIPIDS, COAGULATION FACTORS AND LIVER HISTOLOGY OF LONG-TERM ETHANOL ADMINISTRATION TO GUINEA-PIGS.

(*E.*) Wallerstedt, S.; Olsson, R.; Korsan-Bengtsen, K. (Medical Clinic II, Sahlgrenska Hosp., Univ. Göteberg, Sweden). *Acta Hepatogastroenterol.* 22(4):236-241, 1975.

The reaction of liver to prolonged ethanol administration was studied in guinea pigs. The animals were divided into two groups; one group (18) received 20% v/v ethanol in the drinking water, while the second group (13 controls) received an isocaloric concentration of glucose in the drinking water. During the following 8 months, the caloric intake from ethanol amounted to 40.5% of the total calories or 10.6 g of ethanol/kg. After an initial accommodation period, the body weights increased steadily in the control group, but remained relatively constant in the ethanol group. Triglyceride and cholesterol levels increased in the liver and serum. The persistence of liver triglyceride increase in spite of the low fat content of the diet was in contrast to experiences in the rat. A slight depression of coagulation factors II, VII, X, and XI was observed in the ethanol-fed rats. No alcoholic cirrhosis or hepatitis developed, which indicates that the guinea pig, like the rat and the rabbit, is not suitable for studies of the pathogenesis of chronic liver disease seen after chronic alcohol consumption in man.

8246 STUDIES ON THE TOXICITY OF SULFATED AND NONSULFATED BILE ACIDS.

(Ger.) Czygan, P.; Stiehl, A. (Medizinische Universitatsklinik Heidelberg, D-6900 Heidelberg, Germany). *Z. Gastroenterol.* 13(4):468-473, 1975.

The hepatotoxicity of taurolithocholic (TLC) and taurochenodeoxycholic (TCDC) acids and their sulfate esters was studied in male Wistar rats 1 to 24 hr after administration of a single dose of 100 mg/kg, i.v. in an albumin solution. Controls received only the albumin solution. TLC increased serum bilirubin concentrations to 0.8 ± 0.2 mg/100 ml after one hr, to 1.0 ± 0.3 mg/100 ml after four hr, to 4.6 ± 0.3 mg/100 ml after 12 hr, and to 0.6 ± 0.2 mg/100 ml after 24 hr. Neither TLC sulfate, TCDC, nor TCDC sulfate had any effect on serum bilirubin levels. Lipoprotein X was only positive in rats treated 12 hr previously with TLC. A 15- to 16-fold increase in SGPT and a 14-fold increase in SGOT occurred 12 hr after administration of TLC, while TCDC caused five- to six-fold increases in these two enzymes after 12 hr. The sulfate esters of TLC and TCDC had no effect on either SGOT or SGPT. In contrast to *in vitro* studies, which showed that low concentrations of both TLC and TCDC competitively inhibit oxidative aminopyrine demethylation in rat liver microsomes and higher concentrations destroy the enzyme system, oxidative demethylation of aminopyrine was significantly inhibited only in microsomal preparations from rats treated with TLC. Aminopyrine demethylation in microsomes from rats given TLC sulfate, TCDC, or TCDC sulfate did not differ significantly from that in control preparations. Neither of these bile acids nor their sulfates had any effect on aniline hydroxylation, either *in vitro* or in microsomes from rats to which they had been administered. These results indicate that the sulfate esters of TLC and TCDC are not hepatotoxic in rats.

8247 EFFECTS OF CHLORPROMAZINE ON BILIRUBIN METABOLISM AND BILIARY SECRETION IN THE RAT.

(E.) Knodell, R. G. (Walter Reed Army Medical Center, Washington, D.C. 20012). *Gastroenterology* 69(4):965-972, 1975.

The effects of acute and chronic chlorpromazine administration on bilirubin metabolism and biliary secretion in the rat were investigated in an attempt to define the mechanisms involved in chlorpromazine hepatotoxicity. In acute experiments, 5 to 25 mg/kg of chlorpromazine were given i.v.; in chronic experiments, Walter Reed rats received 25 mg/kg of chlorpromazine i.p. for four or eight days. Acute treatment (25 mg/kg) produced hemolysis and resulted in increased bilirubin output and stimulation of hepatic heme synthesis. Unconjugated bilirubin appeared in bile together with a γ-azopigment that is found in biliary obstruction in both the rat and man. Acute infusion of hemoglobin solutions to stimulate the hemolysis produced by acute chlorpromazine treatment resulted in increased bilirubin output and increased heme synthesis, but no alterations were seen in the normal conjugation pattern of bilirubin in bile. Chronic chlorpromazine treatment for four and eight days increased bilirubin output without elevating plasma hemoglobin levels, and increased the fraction of monoconjugated bilirubin in bile; treatment for eight days also led to the appearance of unconjugated bilirubin in bile. No change in liver weight, bile salt, phospholipid, or cholesterol output was seen with chronic chlorpromazine therapy. Changes in bilirubin conjugation produced by chlorpromazine may provide a significant clue to chlorpromazine-induced cholestasis. Both unconjugated and monoconjugated bilirubin may be less soluble in bile than the disconjugated bilirubin and could lead to formation of biliary sludge or precipitation of bilirubin in the canaliculi. Such a precipitate could either directly produce the cholestatic lesion characteristic of chlorpromazine injury or initiate an inflammatory or immunologic response leading to cholestasis.

8248 EFFECTS OF CITRATE AND TIADENOL ON PHYSICOCHEMICAL EQUILIBRIUM OF BILE IN RATS.

(E.) Rozé, C.; Vaille, C.; Souchard, M.; de La Tour, J.; Debray, C. (Hôpital Bichat, Paris, France). *Digestion* 12(2):114-117, 1975.

Bile salts, cholesterol, and phospholipids were determined in bile collected from Wistar rats after one or four weeks of feeding of standard diets containing 20% Na and K citrates, 0.5% tiadenol (a hypolipemic factor), or tiadenol plus citrates. Liver weight and blood cholesterol were also measured. Liver weight did not change after citrate alone and increased less with the mixed diet than with tiadenol alone. The bile salt concentration increased with citrate (55% after 1 wk, 49% after 4 wk) and with the mixed diet; it was not changed after one week of tiadenol and was slightly decreased after four weeks of tiadenol. Phospholipid levels increased slightly with citrate and more with citrate than with the mixed diet. Tiadenol had no effect. Bile cholesterol concentrations decreased after tiadenol inclusion (45% after 1 wk, 70% after 4 wk), did not change or decreased slightly with citrate use alone, and were unaffected by the mixed diet. The mean value of the cholesterol solubility ratio (bile salts + phospholipids/cholesterol) increased in all treatment groups. With the mixed diet, the ratio did not increase any more than in each of the groups receiving a single drug. Thus, no potentiation is obtained in a diet containing both factors.

8249 HEPATIC, VASCULAR AND BILIARY RESPONSES TO INFUSION OF GASTROINTESTINAL HORMONES AND BILE SALTS. *(E.)* Post, J. A.; Hanson, K. M. (Ohio State Univ. Coll. Medicine, Columbus, Ohio). *Digestion* 12(2):65-77, 1975.

The effects of secretin, cholecystokinin, synthetic pentagastrin, sodium dehydrocholate, and sodium taurocholate on hemodynamics of the canine liver were studied in 57 dogs. Dehydrocholate (30.6 mg/min, i.v.) and cholecystokinin (2.73 U/min, i.v.) significantly decreased systemic arterial pressure while the other substances did not. The systemic arterial pressure declined from 120 ± 6 to 105 ± 6 mm Hg after 60 min of dehydrocholate infusion and from 121 ± 5 to 113 ± 5 mm Hg after a 30-min cholecystokinin infusion. Hepatic arterial vessels were dilated by pentagastrin (10 μg/kg/hr, i.v.) and the bile salts; however, flow was not increased in the latter case. Intrahepatic portal venous resistance was decreased by pentagastrin and increased by bile salts. Portal flow was decreased by the bile salts and increased by pentagastrin. Apart from this, mean changes in portal venous flow and portal pressure were not statistically significant. All the substances infused were potent choleretic agents except pentagastrin which produced a relatively small, transient increase in bile flow. It is concluded that marked bile-flow increases may occur even in the presence of decreased liver blood flow.

8250 EFFECT OF INSULIN ON ALBUMIN PRODUCTION AND INCORPORATION OF ^{14}C-LEUCINE INTO PROTEINS IN ISOLATED PARENCHYMAL LIVER CELLS FROM NORMAL RATS. *(E.)* Dich, J.; Gluud, C. N. (Dept. Biochemistry A, Panum Inst., Univ. Copenhagen, Copenhagen, Denmark). *Acta Physiol. Scand.* 94(2):236-243, 1975.

The *in vitro* effect of insulin (10^{-6} to 10^{-10} M) on albumin production and on the incorporation of ^{14}C-leucine (0.5 μCi) into secreted proteins (proteins found in the medium) and cell proteins was studied in isolated liver parenchymal cells from normal female Wistar rats. The liver cells were isolated by a modified collagenase method and were incubated in Hanks solution containing glucose, HEPES, amino acids, bovine serum albumin, L-[U-^{14}C]leucine, and insulin or solvent. The addition of insulin to the incubation medium significantly increased immunologically measured albumin production and the incorporation of labeled leucine into albumin; the effect was dose dependent. Insulin increased albumin production 50% at 10^{-6} M, 21% at 10^{-8} M, 16% at 10^{-9} M, and 17% at 10^{-10} M. The incorporation of labeled leucine was increased by 50%, 21%, 11%, and 8% at insulin concentrations of 10^{-6} M, 10^{-8} M, 10^{-9} M, and 10^{-10} M, resp. The effects on the two parameters were positively correlated. The increment in the medium and cell suspension rat albumin concentrations increased linearly with time, as did the incorporation of leucine into albumin. A lag of 15 to 20 min was observed before labeled albumin appeared in the medium. The intracellular albumin level remained nearly constant at 109 μg/g liver. The incorporation of ^{14}C-leucine into proteins secreted into the medium was also enhanced by insulin (10^{-6} to 10^{-10} M of insulin increased secretion by 40 to 9%), as was the incorporation into cell proteins (10^{-6} to 10^{-10} M increased incorporation 20 to 8%). The time course of leucine incorporation into proteins secreted into the medium was similar to that of the incorporation into albumin; incorporation into proteins in the cell suspension started immediately after addition of the tracer and proceeded linearly for 60 to 75 min, a plateau being reached after about 90 min. The data suggest a direct effect of insulin on the synthesis of albumin.

8251 OUTPUT OF BILIRUBIN AND PANCREATIC ENZYMES IN RESPONSE TO DIFFERENT LIQUID TEST MEALS IN MAN. *(E.)* Ekelund, K.; Johansson, C. (Karolinksa Hosp., Stockholm, Sweden). *Scand. J. Gastroenterol.* 10(5):507-511, 1975.

The outputs of bilirubin and pancreatic enzymes in 23 healthy subjects (18 men and 5 women, aged 21-32 yr) were examined after ingestion of three different liquid test meals. Two groups of subjects were given composite meals differing in their protein content (3.6 or 7.2% skim milk protein) but containing identical amounts of lactose, glucose, corn oil, and polyethylene glycol test marker. The third test meal was a 15% glucose solution. The emptying rate of fat and sugar was approximately equal after both composite meals but that of protein was faster after the high-protein meal. The delivery of more protein per unit time to the intestine was followed by a higher output of bilirubin and pancreatic enzymes (amylase, lipase, and trypsin). After ingestion of the 15% glucose solution, the output of pancreatic enzymes and bilirubin increased considerably for the first hour but then declined. After all meals, the initial pancreatic and biliary responses were higher than during the subsequent two hr. This is due to the rapid early delivery of food constituents to the intestine and/or volume distension of the stomach and the intestine. The differences in enzyme and bilirubin output corresponded to differences in quality and quantity of the emptied food components.

8252 BILIRUBIN AS A CHOLESTATIC AGENT. III. PREVENTION OF BILIRUBIN-RELATED CHOLESTASIS BY SULFOBROMOPHTHALEIN.

(E.) Witzleben, C. L.; Boyce, W. H. (Univ. Pennsylvania Medical Sch., 36th and Hamilton Walk, Philadelphia, Pa. 19104). *Arch. Pathol.* 99(9):492-495, 1975.

The effects of BSP on manganese-bilirubin-induced cholestasis were studied in male Sprague-Dawley rats. The animals were fasted after i.v. manganese administration, bile collection being started 4 hr later. Bilirubin (10 ml, given i.v. at a rate of 0.33 ml/min) was administered continuously and BSP (2.5 ml, i.v. at a rate of 0.33 ml/min) was infused intermittently beginning 5 to 10 min after bile collection; the two agents were given either simultaneously or separately. Bilirubin alone caused a marked drop in bile flow rate in the manganese-loaded rats, while BSP alone caused a mild choleresis. When given simultaneously with the bilirubin, BSP effectively prevented the manganese-bilirubin cholestasis. When the rats were killed ten min after the beginning of bilirubin infusion (i.e., in the immediate precholestatic interval), the bilirubin levels in the blood were higher in the BSP-treated animals; the levels in the liver were the same in the BSP-treated and nontreated animals; and levels in the bile were reduced in the BSP-treated animals. Increasing the bilirubin load while keeping the BSP load unchanged tended to reinstate the cholestasis and increased the bile bilirubin concentration significantly. When serial bile bilirubin concentrations were determined over a 70-min period of continuous cannulation, the levels rose rapidly to similar values in the presence of differing bilirubin loads. Thus, BSP did not prevent cholestasis through an effect on the total biliary bilirubin concentration *per se*. It is likely that the anticholestatic activity of this agent is related to an ability to prevent manganese-bilirubin interaction, or to an ability to prevent the binding or reaction of bilirubin and manganese with some critical intracellular organelle or metabolite.

8253 BILIRUBIN AS A CHOLESTATIC AGENT. IV. EFFECT OF BILIRUBIN AND SULFOBROMOPHTHALEIN (BSP) ON BILIARY MANGANESE EXCRETION.

(E.) Witzleben, C.; Boyce, W. H. (Univ. Pennsylvania Medical Sch., 36th and Hamilton Walk, Philadelphia, Pa. 19104). *Arch. Pathol.* 99(9):496-498, 1975.

The basic pathogenesis of the cholestasis induced by manganese-bilirubin overload in the rat was studied. Male Sprague-Dawley rats were injected with manganese, fasted, and subjected to bile duct cannulation. Ten min later, i.v. bilirubin infusion (10 ml of a 75 mg/100 ml solution) was started, or the animals were infused with a BSP solution (2.5 mg/kg in 2.5 ml infusate over a 30 min period). The bile was collected in manganese-free polyethylene tubes. Bilirubin caused an increase in the manganese concentration in the bile but had no effect on the total amount of manganese excreted in the bile. When the bile from the animals treated with bilirubin and manganese was allowed to stand, a precipitate containing a small amount of manganese (1.3 μg/10 min bile collection) formed. BSP caused a significant increase in both the biliary manganese concentration and the total amount of manganese excreted in the bile. Thus, BSP induced a real increase in biliary manganese excretion. The data appear to indicate that the concentration of manganese *per se* in the bile is not a critical determinant in the development of manganese-bilirubin cholestasis.

8254 INFLUENCE OF DIETARY LIPIDS ON IRON AND COPPER LEVELS OF RATS ADMINISTERED ORAL CONTRACEPTIVES.

(E.) Onderka, H. K.; Kirksey, A. (Dept. Foods and Nutrition, Purdue Univ., W. Lafayette, Indiana 47907). *J. Nutr.* 105(10):1269-1277, 1975.

The relation between oral contraceptives (OC) and dietary lipids as compared to iron and copper levels in the plasma and tissues of rats was investigated. In experiment I, 128 female Wistar rats were divided into four groups of 32 rats each. For 15 wk two groups were fed a diet containing 20% safflower oil and two groups received a diet of hydrogenated 20% coconut oil. Cholesterol (0.5%) was included in diets fed to one-half of the groups fed either safflower or coconut oil. For four additional wk, three OC agents (Ovulen, Provest and Enovid) were randomly administered to three groups of eight animals in each of the four dietary regimens. The effectiveness of an OC was determined by daily vaginal smears. In experiment II, 28 females were divided evenly into four groups: group I received a control diet plus 20% safflower oil; group II received a control diet plus 0.5% sodium glycocholate; group III received a control diet plus 0.5% cholesterol; and group IV received a control diet plus 0.5% sodium glycocholate and 0.5% cholesterol. All diets were fed for seven wk. In both experiments, blood, liver, kidney, spleen and fecal iron and copper levels were determined by atomic absorption. Blood copper oxidase (CO) activity was measured and used to calculate ceruloplasmin concentration. Hemoglobin was measured as cyanohemoglobin and RBC concentration by a hemacytometer. The OC treatment caused an overall 11% reduction in food consumption. There was no significant difference in hemoglobin level, hematocrit, RBC concentration, mean cell volume, iron or copper levels in plasma. The type of dietary fat had no significant influence on plasma iron, copper, ceruloplasmin or other hematological indices. Rats fed cholesterol had significantly lower plasma iron but increased plasma copper due to an increase in ceruloplasmin. The livers of rats on cholesterol were fatty, pale yellow and larger than those not fed cholesterol. Cholesterol in the diet also increased spleen size by 11%. The effect of cholesterol on liver size was intensified by safflower oil. The OCs affected tissue iron or copper levels only in the liver. Animals fed OC, cholesterol and safflower oil had higher liver copper than those with OC fed either oil without cholesterol. Sodium glycocholate increased iron absorption from 18.2 to 82.4%. Cholesterol alone depressed iron absorption to 7.5% but in addition to sodium glycocholate there was a 23% iron absorption. The areas most responsive to changes in dietary lipid appear to be the liver and kidneys with copper levels being most sensitive to dietary and/or hormonal changes.

8255 HEPATIC DRUG METABOLISM IN RETINOL-DEFICIENT RATS. *(E.)* Colby, H. D.; Kramer, R. E.; Greiner, J. W.; Robinson, D. A.; Krause, R. F.; Canady, W. J. (West Virginia Univ. Sch. Med., Morgantown). *Biochem. Pharmacol.* 24(17): 1644-1646, 1975.

The effects of retinol deficiency on hepatic oxidative metabolism were studied in disease-free, weanling male Wistar rats. Control, retinol-deficient, and retinol supplemented (6 mg/kg diet) retinol-deficient animals were fasted prior to sacrifice. Liver microsomal suspensions from these animals were analyzed for protein, retinol, and cytochrome P-450 contents and for oxidative metabolism. The body weights, liver weights, and hepatic microsomal retinol, protein, and cytochrome P-450 contents were lower in the retinol-deficient rats than in retinol-supplemented and control animals. The hepatic metabolism of ethylmorphine (demethylation) and aniline (hydroxylation), whether expressed per unit tissue weight or per mg microsomal protein, was also significantly impaired in the retinol-deficient animals as compared with the other 2 groups. Retinol deficiency reduced the binding affinities of cytochrome P-450 for ethylmorphine and hexobarbital, but increased those for ethylbenzene and naphthalene; these changes were completely reversed by retinol supplementation. The *in vitro* addition of retinol to hepatic microsomes from retinol-deficient rats further lowered oxidative metabolism. The spectral dissociation constants for hydrocarbon or drug substrates in the hepatic microsomes were unaffected by similar concentrations of retinol *in vitro*. The data indicate that retinol is required for the maintenance of normal hepatic cytochrome P-450 levels and oxidative metabolism. Since none of the changes caused by retinol deficiency could be reversed by addition of retinol to hepatic microsomes, the decrease in the rate of drug metabolism in retinol-deficient rats is apparently due to an overall reduction in the hepatic microsomal protein content, a fall in the specific activity of oxidative enzymes, and changes in the hemoprotein content. The results are also consistent with an increase in the hydrophobicity of cytochrome P-450 in retinol-deficient animals.

8256 FATTY LIVER INDUCED BY TETRACYCLINE IN THE RAT. DOSE-RESPONSE RELATIONSHIPS AND EFFECT OF SEX. *(E.)* Breen, K. J.; Schenker, S.; Heimberg, M. (Vanderbilt Univ. Sch. Medicine, Nashville, Tenn.). *Gastroenterology* 69(3):714-723, 1975.

Dose-response relations, biochemical mechanisms and sex differences in experimental fatty liver induced by tetracycline were studied in intact and isolated perfused rat liver of male and female (pregnant and non-pregnant) Sprague-Dawley rats. In the intact rats, tetracycline (100 mg/kg) caused an increase in the triglyceride content; no dose-dependent relation was noted. In isolated perfused liver (both males and females) with adequate oleic acid as the substrate, a direct relation was observed between tetracycline dose and both hepatic triglyceride accumulation and depression of triglyceride output. Hepatic triglyceride output and concentrations were markedly different in male and female rats with regard to base line concentrations. However, in all treated animals the percent increase in hepatic triglyceride concentrations was similar. Livers from females, especially pregnant ones, were more resistant to the effect of tetracycline. These differences between the sexes could not be related to the altered disposition of tetracycline or oleic acid uptake. Tetracycline had no effect on the hepatic concentrations of phospholipids, cholesterol, glucose or ketone body output. Depressed hepatic secretion of triglyceride accounted for 30 to 50% of accumulated hepatic triglyceride, indicating that additional mechanisms must be involved in the production of triglyceride-rich fatty liver in response to tetracyline.

8257 STIMULATION OF RAT LIVER ADENYLATE CYCLASE BY HALOTHANE. *(E.)* Rosenberg, H.; Pohl, S. (Univ. Pennsylvania Sch. Med., Philadelphia). *Life Sci.* 17(3):431-434, 1975.

The effects of halothane (0-40 mg/100 ml in the liquid phase) on basal, glucagon-stimulated (5×10^{-5} M), and sodium fluoride-stimulated (20 mM) adenylate cyclase activity were determined by using a highly purified plasma membrane preparation from the livers of female Sprague-Dawley rats. The membranes were prepared by a modification of the procedure of Neville and were exposed to halothane for 10 min prior to the determination of adenylate cyclase. Basal adenylate cyclase activity was stimulated by about 25% at halothane concentrations up to 30 mg/100 ml. Higher concentrations increased enzyme activity even further. Glucagon-stimulated adenylate cyclase activity was augmented at all halothane concentrations greater than 30 mg/100 ml, whereas sodium fluoride-stimulated activity was significantly increased only by concentrations of 30-40 mg/100 ml. The data indicate that halothane in clinical and toxic concentrations is a direct stimulant of adenylate cyclase.

8258 ANIMAL EXPERIMENTS ON LIVER INJURY FOLLOWING HALOTHANE ANESTHESIA AND HYPOXIA. *(Ger.)* Kramer, M.; L'Allemand, H. (Zentrum Chirurgie, Justus-Liebig-Universitat, D-6300 Giessen, Klinikstr. 37, Germany). *Anaesthesist* 24(3):107-111, 1975.

Activities of glutamate-oxalate transaminase (GOT), glutamate-pyruvate transaminase (GPT), glycerophosphate, glucose dehydrogenase (GLDH), creatine phosphokinase, leucine aminopeptidase (LAP), alkaline phosphatase, cholinesterase (ChE), LDH, and α-hydroxybutyrate dehydrogenase were measured in serum and liver homogenate samples from 197 female BR46 Wistar II rats, 40 and 60 hr after 4-hr exposures to anesthesia and/or hypoxia and from 73 rats who were untreated controls. Of the 197 rats, (1) 44 were given a mixture of 12% O_2 and 88% nitrous oxide (hypoxia group); (2) 50 received 0.5 volume % halothane mixed with 50% O_2 and 50% nitrous oxide; (3) 50 were treated the same as rats in group 2 but under hypoxic conditions; and (4) 40 were anesthetized three times at five-day intervals under normal and hypoxic conditions. No significant changes were observed in serum from rats in group 2, 40 hr after anesthesia, but GOT, GPT, and ChE activities in liver homogenate were significantly decreased. Serum GPT and GLDH activities were significantly increased 40 hr after the last exposure to halothane under normal conditions in rats in group (4). These changes were even more pronounced in liver homogenates in which GOT, GLDH, LAP, and ChE activities were significantly increased over control values. If these animals were sacrificed at 60 hr, rather than 40 hr after their last exposure to halothane, enzyme activities tended to normalize: serum GLDH was still increased and ChE decreased, while liver GOT and LAP were increased. Reduction of the amount of O_2 administered from 50% to 12% had no effect on enzyme activities in either the serum or liver. No significant differences were observed between animals in group 4 who were anesthetized under normal conditions and those anesthetized under hypoxic conditions. However, if O_2 was reduced from 12% to 8% and given in combination with halothane, almost all animals died of heart failure.

8259 THE EFFECTS OF IRON DEFICIENCY ON RAT LIVER ENZYMES.

(E.) Bailey-Wood, R.; Blayney, L. M.; Muir, J. R.; Jacobs, A. (Welsh Natl. Sch. Med., Cardiff). *Br. J. Exp. Pathol.* 56(3): 193-198, 1975.

The effects of iron deficiency on electron transport and mitochondrial and microsomal reductase systems in rat liver were studied in male animals started at age 3 weeks on iron deficient (1-2 mg/kg) and iron supplemented (180 mg/kg) diets. The animals were fasted and killed at age 7 or 14 weeks and the activities of NADH-cytochrome C reductase, NADH-ferricyanide reductase, succinate-cytochrome C reductase, succinate-ferricyanide reductase, cytochrome oxidase, cytochrome P-450, 6-phosphogluconate dehydrogenase, and glucose 6-phosphate dehydrogenase were determined in the liver mitochondrial, microsomal, and supernatant fractions. Determinations were also made of body and liver weight, hemoglobin content, serum iron, total iron binding capacity, transferrin saturation, and liver nonheme iron. Serum iron concentrations, transferrin saturation, and liver nonheme iron were significantly decreased and the total iron binding capacity was elevated in the iron-deficient animals at 7 and 14 weeks. The body and liver weights of the iron-deficient animals were also significantly reduced, although the liver weight/body weight ratio remained unchanged. The microsomal, but not the mitochondrial, activities of NADH-cytochrome C reductase and NADH-ferricyanide reductase were significantly reduced (by about 35%) in iron-deficient animals at age 14 weeks. At 14 weeks, but not at 7, the succinate-cytochrome C reductase values were decreased to about 1/2 of normal values in the iron-deficient rats. There was no decrease in succinate-ferricyanide reductase or cytochrome oxidase activity or in the cytochrome P-450 concentration. At 7 weeks, 6-phosphogluconate and glucose 6-phosphate dehydrogenase activities in the soluble fraction were decreased by 51 and 53%, resp., in iron-deficient rats. At 14 weeks, the activity of glucose 6-phosphate dehydrogenase in the iron-deficient rats was 45% lower than normal values, but the activity of 6-phosphogluconate dehydrogenase in the normal animals had decreased to the level found in the iron-deficient animals. Thus, microsomal and mitochondrial reductases and the components of the mitochondrial electron transport pathway are affected to varying degrees and, in some cases, perhaps indirectly, by iron deficiency.

8260 THE ROLE OF IRON IN THE PATHOGENESIS OF PORPHYRIA CUTANEA TARDA.

(E.) Kushner, J. P.; Steinmuller, D. P.; Lee, G. R. (Veteran's Admin. Hosp., Salt Lake City, Utah 84132). *J. Clin. Invest.* 56(2):661-667, 1975.

The effect of iron on uroporphyrinogen decarboxylase (URODECARB) activity in pig crude liver extracts was studied. Mitochondria-free liver extracts were incubated for two hr at 37 C with 6.7 mM of cysteine in Tris-HCl buffer, with experimental samples containing ferrous ammonium sulfate (0.7 mM Fe). URODECARB was assayed using a modified method of Romeo and Levin. The reaction products, porphyrinogens, were analyzed by three methods: solvent extraction, paper chromatography-liquid scintillation, and thin layer-liquid scintillation. In the solvent extraction method, neither cysteine nor iron alone had any effect on URODECARB activity, but in combination they produced a mean of 44% inhibition (from 0.23 to 0.13 U/mg of protein). The results were similar with the paper chromatography-liquid scintillation method, with iron causing a 41% reduction in URODECARB activity (from 0.39 to 0.22 U/mg of protein). In the thin layer-liquid scintillation method, the effect of iron varied with the substrate used: when uroporphyrinogen I was the substrate, iron caused a 40% reduction in URODECARB activity (from 0.77 to 0.46 U/mg of protein); but when uroporphyrinogen III was used, there was only a 24% reduction (from 0.79 to 0.60 U/mg of protein). The inhibition of URODECARB activity by iron was demonstrated by all three methods, with the thin layer method giving the highest specific activity. Iron overload does not induce porphyrin cutanea tarda (PCT), but PCT patients may have an unusual sensitivity to the effects of iron. The study suggests that PCT occurs in patients with a genetically determined abnormality in URODECARB activity and that the condition may remain latent until excessive hepatic iron stores are accumulated.

8261 MANGANESE INDUCED HEPATIC LESIONS IN CARBON TETRACHLORIDE PRETREATED RATS.

(E.) Chandra, S. V.; Saxena, D. K. (Industrial Toxicology Res. Center, Lucknow, India). *Exp. Pathol.* 10(5/6):285-288, 1975.

Manganese induced cirrhosis was produced in carbon tetrachloride pretreated rats. Forty-six male albino rats were divided into four experimental groups: group I (10 rats) served as controls; group II (10 rats) was given 6 mg/kg $MnSO_4 \cdot 4H_2O$, i.p. daily for 30 days; group III (16 rats) was given CCl_4 (1 ml/kg), p.o., every third day for ten feedings, and two rats were sacrificed one day after last feeding and the rest were given $MnSO_4 \cdot 4H_2O$ (6 mg/kg) i.p. daily for 30 days; and group IV (10 rats) was given CCl_4 as above (10 doses) and then injected, i.p., with saline (0.5 ml) daily for 30 days. Histological and histochemical studies revealed no gross abnormality in any organs, either in the control animals or the $MnSO_4 \cdot 4H_2O$-treated rats. The livers of CCl_4-treated animals were soft and pale while manganese sulfate-treated livers showed marked congestion. The CCl_4-treated livers showed moderate degree of fatty change and degeneration of cells around central veins with slightly increased cellularity around portal tracts. Manganese sulfate-treated livers showed mild congestion of central veins and adjacent sinusoids, and mild bile duct proliferation. Manganese treatment after CCl_4 treatment induced persistent fatty change of cells surrounding central veins. Large areas of focal necrosis with degenerated hepatocytes, inflammatory cells and hyperplasia of Kupffer cells were also evident. Administration of manganese sulfate for 30 days did not damage hepatocytes; however, the same amount of metal in already damaged livers will produce degeneration and necrotic changes in the parenchyma. This extensive damage produced by manganese in CCl_4-pretreated rats may be due to increased manganese absorption and storage in the injured liver. It was suggested that workers handling manganese and having liver dysfunction may be more susceptible to manganese toxicity.

8262 EFFECTS OF DIFFERENT VITAMIN E-DEFICIENT BASAL DIETS ON HEPATIC CATALASE AND MICROSOMAL CYTOCHROMES P-450 AND b_5 IN RATS.

(E.) Hauswirth, J. W.; Nair, P. P. (Sinai Hosp., Baltimore, Md. 21215). *Am. J. Clin. Nutr.* 28(10):1087-1094, 1975.

The effects of commonly used formulations of vitamin and mineral supplements on hepatic hemeproteins were studied in male Sprague-Dawley rats maintained for 6 or 12 weeks on a basal, vitamin E-deficient diet consisting of 70% sucrose, 20% vitamin-free casein, and 4% tocopherol-stripped lard. This diet was supplemented with 4% United States Pharmacopoeia (USP) salt mixture XIV and 2% tocopherol-free NBC vitamin fortification mixture, 4% USP salt mixture XIV and 2% vitamin fortification mixture (tocopherol-free) according to Weglicki, 4% Briggs' salt mixture and the Weglicki vitamin fortification mixture, or 4% Briggs' salt mixture and 2% NBC vitamin fortification mixture. The USP salt mixture XIV contains five times the amount of iron present in the Briggs' salt mixture, while the NBC vitamin fortification mixture contains 45 times more menaquinone (vitamin K_3) than the Weglicki vitamin mixture. Among rats maintained on the vitamin E-deficient diet for six weeks, only those that received the combination of salt mixture USP XIV and the Weglicki vitamin fortification mixture showed a significantly lower level of hepatic catalase activity compared with the corresponding control animals. Hepatic microsomes from rats fed the experimental diets for six weeks showed no significant differences in P-450 and b_5 cytochrome levels. After 12 wk on the vitamin E-deficient diet, a significant depression in these cytochromes was noted in all experimental groups except that given the salt mixture USP XIV and NBC vitamin fortification mixture. At the end of 12 wk, hepatic catalase activity was significantly higher in rats maintained on the latter diet than in those given the salt mixture USP XIV and the Weglicki vitamin mixture. Since the most striking differences in the diets studied are in their content of iron and menaquinone, it appears that these two dietary constituents may interact in modulating the effect of vitamin E on hepatic hemeproteins.

8263 INVESTIGATIONS ON THE PATHOGENESIS OF LOCAL IRRADIATION-INDUCED LIVER FUNCTION DISORDERS.

(Ger.) Svesnikov, A. A.; Gileva, T. P.; Bandurko, L. N. (Acad. Med. Sci., Obninsk, USSR). *Radiobiol. Radiother. (Berl.)* 15(6):731-740, 1974.

Histological changes in the liver were compared with liver function tests (serum protein fractions, serum BSP retention, biliary excretion of sodium benzoate, and serum bilirubin levels) performed on male and female rabbits following irradiation of: (1) the surgically exposed liver (3000, 6000, and 12,000 rad); (2) the surgically exposed stomach (1000, 1200, and 1600 rad); or (3) a 6 x 10 cm field, 6 cm below the xiphoid process which did not include either the stomach or liver. Studies were performed three and seven days after irradiation and weekly thereafter until the results of liver function tests normalized. The source of γ-radiation was ^{60}Co, and controls were nonirradiated animals subjected to the same surgical procedures as groups 1 and 2. In group 1, irradiation suppressed connective tissue proliferation around foci of necrosis in the hepatic parenchyma. BSP retention was increased, the extent of the increase being dose-dependent. Exposure to 12,000 rad increased BSP maximum retention to almost 13 times the control value. After 21 days, the 6,000- and 12,000-rad doses had increased serum bilirubin levels two- to four-fold; these doses also reduced total serum protein levels and changed the serum protein pattern. A dose-dependent decrease in biliary excretion of sodium benzoate followed irradiation with all doses. Irradiation of the exposed stomach had less effect on the results of liver function tests which normalized sooner than those done when the exposed liver was irradiated. Morphological changes in the liver consisted of granular dystrophy and the lysis of small groups of hepatocytes around the central vein; moderate interlobular connective tissue proliferation was also observed after irradiation with 1600 rad. All rabbits in group 3 exposed to 2500 or 3200 rad died 15 to 28 days after irradiation. At doses of 2500 and 3200 rad, BSP retention and serum bilirubin values increased, serum protein concentrations changed, and biliary excretion of sodium benzoate decreased significantly. Exposure to all three doses produced edema and proliferation of interstitial connective tissue followed by proliferation of connective tissue around interlobular blood vessels and, in some cases, granular hepatocytic dystrophy and lysis of small groups of hepatocytes in the central zones of the lobules. Some rabbits had small, focalized hematomas in these areas. The extent of these changes were dose-dependent. These findings, and results from previous investigations, suggest that intra-abdominal irradiation of the hepatic region produces latent liver damage due to the indirect effect on other irradiated organs.

8264 THE COMBINED USE OF ORAL CHOLECYSTOPAQUE MEDIA AND IODIPAMIDE. *(E.)* Goergen, T.; Goldberger, L. E.; Berk, R. N. (Univ. California-San Diego Sch. Medicine, La Jolla, Calif.). *Radiology* 111(3):543-546, 1974.

Studies were performed to measure concentrations of iodipamide and total iodine excreted in bile after p.o. cholecystography with iopanoic acid and ipodate and i.v. cholangiography. Five fasting adult dogs were used. Total bile flow was collected *via* catheters every 15 min by gravity. Iodipamide concentration in bile was determined using a well-type gamma counter. When dogs were given a combination of iopanoic acid and iodipamide by infusion, the biliary excretion of iodipamide decreased by 90% after eight hr of infusion. In dogs given iodipamide alone or those given iopanoic acid p.o. followed 14 hr later with iodipamide, there was no significant difference in mean iodipamide excretion. Total biliary iodine concentration was identical to iodipamide iodine when 1.0 or 3.0 g of ipodate was instilled into the duodenum 30 min prior to infusion of iodipamide (0.3 ml/kg). The larger dose produced a significant decrease in the concentration of iodipamide from 8 mg/kg to 6 mg/kg. Similar results were obtained with a 0.6 ml/kg dose of iodipamide. When 1.0 or 3.0 g of ipodate was given in combination with 0.3 or 0.6 ml/kg of iodipamide, the total bile iodine concentrations increased from 15 mg/ml with iodipamide alone to 18 mg/ml in combination. When 1.0 g of ipodate was given with 0.6 ml/kg of iodipamide, the total iodine concentration in bile equaled control values. Ipodate and iodipamide compete for excretion on a dose-related basis, but any diminution of iodipamide concentration is compensated by the presence of ipodate or iopanoic acid in the bile. Biliary contrast materials can be used in sequence without risk of impaired visualization in the i.v. cholangiogram. A risk of nephrotoxicity can be expected if it is assumed that the diminished iodipamide excretion in bile results in increased urinary excretion of the contrast agent.

8265 INTRAVENOUS CHOLANGIOGRAPHY IN DIFFERENT DEGREES OF COMMON BILE DUCT OBSTRUCTION: AN EXPERIMENTAL STUDY IN THE DOG. *(E.)* Burgener, F. A.; Fischer, H. W.; Adams, J. T. (Univ. Medicine and Dentistry, Rochester, N.Y.). *Invest. Radiol.* 10(4):342-350, 1975.

The most effective dose and rate of administration of contrast agent in i.v. cholangiography were studied in three male mongrel dogs equipped with Thomas cannulas through which complete and incomplete common bile duct obstruction were produced by means of a Foley catheter. ^{125}I-labeled iodipamide (0.3, 0.6, 1.2 or 1.8 ml/kg) was infused into a vein in the foreleg or neck of the fasted dogs over a period of 0.5, 2, or 6 hr. ^{125}I was estimated in samples of serum, bile, and urine collected at intervals throughout and/or at the end of the infusion. With incomplete common bile duct obstruction, the iodine concentration in the bile necessary for radiographic visualization of the common duct was obtained with iodipamide in dosages of 0.3 to 1.2 ml/kg infused over a 30 min period. The largest dose resulted in the highest concentrations of label in the bile. With complete common bile duct obstruction the iodine concentration with all three dose levels was far below that necessary to visualize the duct radiographically. The total amount of iodipamide excreted in the bile increased with increasing contrast material dosage and decreased with increasing obstruction, while the hepatic efficiency for iodipamide excretion decreased with increasing dose and increasing bile duct obstruction. With incomplete obstruction, the iodipamide serum clearance curves did not differ significantly with different dose levels; the slope was more gentle with complete obstruction. The iodipamide serum half times increased with increasing obstruction. With complete common bile duct obstruction, increasing the infusion time had no significant effect on the biliary iodine concentrations. The overall highest biliary iodipamide concentration was found with a dosage of 1.8 ml/kg infused in 30 min. Since even the highest biliary concentration was insufficient to visualize the completely obstructed duct, it is suggested that the currently used dosages of 0.3 and 0.6 ml/kg not be exceeded because of the inherent risk of toxic side effects.

8266 CROSS-DIALYSIS IN THE TREATMENT OF EXPERIMENTAL FULMINANT HEPATIC COMA. *(E.)* Santiago-Delpin, E. A.; Callender, C.; Kjellstrand, C. M.; Buselmeier, T. J.; Najarian, J. S. (Dept. Surgery, Univ. Minnesota, Minneapolis, Minn.). *J. Surg. Res.* 19(3):175-182, 1975.

The potential value of cross-dialysis in the treatment of fulminant hepatic failure was tested in mongrel dogs with massive ischemic necrosis, which was induced by side-to-side portacaval shunt and ligation of the portal triad and of the gastrohepatic ligament. The dogs were then cross-dialyzed against normal healthy dogs in a two-chamber Kiil-type dialyzer containing membranes of different pore size and chemical composition. Four dogs were dialyzed across Union Carbide membranes, three across Amicon PM 30 membranes, and three across cuprophane membranes. Three additional dogs were cross-perfused. Coma developed seven to ten hr after the surgical procedure and untreated controls died two to five hr after onset of coma. Improvement occurred in all cross-perfusion experiments and survival was prolonged to 34.6 hr. Awakening and improvement of coma occurred in seven of the ten dialyzed dogs, with ambulation in three of seven. Two of these animals had been dialyzed with Union Carbide membranes. Survival, however, was prolonged

(20, 21, and 24 hr) in only three animals. In both the cross-perfusion and cross-dialysis experiments, blood pH and oxygen partial pressure were not altered until the end of the experiment. Hypoglycemia was not seen and hemolysis was slight. LDH, SGOT, and SGPT values rose in cross-perfused dogs, whereas in dialyzed dogs SGOT and SGPT levels, as well as creatinine phosphokinase and alkaline phosphatase values, were lower in recipient dogs than in donors. Autopsy showed blood ascites in eight of ten dialyzed animals, with a fluid hematocrit of 4 to 16%. Postmortem findings in perfused dogs were mild bloody ascites, lung congestion, pleural effusions, and essentially dead livers. The results indicate that cross-dialysis is feasible in the management of experimentally induced hepatic coma and liver necrosis, with minimal complications of volume and hemolysis.

8267 STUDIES ON THE OXYGEN SUPPLY OF HETEROTOPIC AUXILIARY LIVER GRAFTS IN RATS.

(E.) Thermann, M.; Zelder, O.; Hess, F.; Jostarndt, L.; Jerusalem, C. R.; Hamelmann, H. (Chirugische Universitatsklinik, Robert-Koch-Strasse 8, D-355 Marburg/Lahn, West Germany). *Eur. Surg. Res.* 7(3):156-163, 1975.

Heterotopic auxiliary liver transplantation was performed in Wistar rats by a modification of the method of Hess *et al.*, and the effects of the procedure on the oxygen supply of the graft were determined by local oxygen partial pressure (PO_2) measurements made with a multiwire Pt-surface electrode. Only two of the seven lobes of the rat liver (=30% of the parenchyma) were used as a graft. In six animals, the PO_2 of graft tissue was determined as follows: after opening of the abdomen; two to three min after ligation of the hepatic artery; after completing preparation of the donor and host; during extracorporeal hemoglobin-free perfusion; and three to six min after revascularization and application of 3 ml of plasma substitute. In seven sham-operated animals, liver tissue PO_2 was measured as follows: after opening the abdomen; two to three min after ligation of the hepatic artery; before ligation of 70% of the parenchyma; and after ligation of five lobes and the application of plasma substitute. Graft liver tissue PO_2 decreased drastically after ligation of the hepatic artery and remained low during the preparation period. During the extracorporeal perfusion phase the graft was anoxic. After revascularization and application of the plasma substitute, the PO_2 of liver parenchyma increased to preoperative values although the graft was supplied with portal blood only. In the sham-operated animals, liver tissue PO_2 remained low before ligation and increased after ligation and application of the plasma substitute. This increase was also seen in the absence of a plasma substitute, indicating that increased tissue PO_2 cannot be accounted for by the hemodilution effect alone. The dominant cause of the increased PO_2 after revascularization may be the increased portal perfusion rate; the whole amount of portal blood supplies only 30% of the liver parenchyma. The PO_2 of the graft parenchyma was low in the first month post-transplantation but increased continually in the following months, reaching normal values after one yr.

8268 INFLUENCE OF A CHRONIC ADMINISTRATION OF DIETHYLNITROSAMINE ON THE RELATION BETWEEN SPECIFIC TISSULAR AND DIVISION FUNCTIONS IN THE RAT LIVER.

(E.) Van Cantfort, J.; Barbason, H. (Service de Chimie médicale, Université de Liège, 151, Bd. de la Constitution, 4000 Liège, Belgium). *Eur. J. Cancer* 11(8):531-536, 1975.

Previous studies in hepatectomized adult rats demonstrated a mutually exclusive relation between the division function of liver and the specific tissular function, monitored by the measurement of cholesterol-7α-hydroxylase activity. In the present study, the evolution of these functions was followed during hepatic carcinogenesis induced in male Sprague-Dawley rats by chronic diethylnitrosamine (DEN) treatment (40 μl/l of drinking water for 100 days). The mitotic index was higher (1%) in DEN-treated animals than in controls, but the normal circadian rhythm of mitoses was not detected. DEN treatment for 25 days partially abolished the circadian rhythm of cholesterol-7α-hydroxylase; treatment for 55 days totally abolished the rhythm. Enzyme activity was significantly lower than normal. Of the two drug-metabolizing enzymes studied, the activity of benzopyrene hydroxylase was almost completely inhibited after 55 days of DEN treatment and that of aminopyrine-N-demethylase was decreased by about 55%. Animals given DEN for 25 days after partial hepatectomy showed no reduction in cholesterol-7α-hydroxylase activity, but the first mitotic wave was inhibited relative to that in operated controls. Partial hepatectomy performed after 25 days of DEN treatment caused no reduction in cholesterol-7α-hydroxylase activity but abolished the nycthermeral rhythm of the enzyme. When partial hepatectomy was performed after 55 days of DEN treatment, animals showed a transient (24 hr) decrease in cholesterol-7α-hydroxylase activity and no nycthemeral rhythm of mitoses. In hepatectomized animals, DEN treatment further inhibited the activities of the drug-metabolizing enzymes. These results suggest that the process of cellular transformation during DEN-induced carcinogenesis involves a derangement in the simultaneous regulation of specific tissular and division functions. In unoperated as well as in partially hepatectomized animals, these two functions lose their normal mutually exclusive regulation and their specific nycthemeral rhythms.

8269 EFFECT OF TOTAL HEPATECTOMY ON SELECTED CEREBRAL SUBSTRATES AND ENZYMES OF THE GLYCOLYTIC PATHWAYS AND KREBS CYCLE.

(E.) Zieve, L.; Nicoloff, D.; Doizaki, W. (Veterans Admin. Hosp., Minneapolis, Minn. 55417). *Surgery* 78(4):414-423, 1975.

The effect of hepatectomy on the brain content of selected substrates (6 from glycolytic pathway and 5 from Krebs cycle) and enzymes (4 and 5, resp.)

involved in glucose metabolism was studied in 16 dogs. Brain biopsies were taken from three dogs two hr postoperatively and from 13 dogs sustained on glucose until lapsing into coma (20-30 hr posthepatectomy). Three sets of controls were used: 12 dogs sedated at biopsy, four dogs sedated for at least 24 hr, and four sedated dogs in hypovolemic shock. Brain tissue extracts were analyzed for the substrates: glucose, G-6-P, dihydroxyacetone phosphate, phosphoenolpyruvate, pyruvate, lactate, ammonia, glutamine, citrate and alpha-ketoglutarate. Enzymes analyzed included: glucokinase, phosphofructokinase, pyruvate kinase, isocitrate dehydrogenase, glutamate dehydrogenase, malate dehydrogenase and malic enzyme. With the exception of lactate, ammonia, and glutamine, all of the substrate measurements were made either by direct fluorometric technique or by indirect ketone method. Enzyme activity and lactate concentration were measured spectrophotometrically while ammonia and glutamine were determined by a microdiffusion technique. There were no significant differences in brain glycolytic substrate concentrations between dogs lapsed into posthepatectomy coma and the normal or sedated dogs. Dogs in shock showed increased levels of brain pyruvate, lactate, moderate increases in citrate and alpha-ketoglutarate, and decreases in fumarate and malate. There was no significant alteration in brain enzyme activity after hepatectomy. However, dogs in shock showed increased glucokinase and decreased glutamine dehydrogenase activity. Cerebral ATP concentration was unchanged, but ammonia and glutamine concentrations were increased threefold. It was concluded that hepatectomy had no unique effect on the brain content of glycolytic pathway or Krebs cycle substrates and enzymes, nor on the brain content of ATP.

8270 AN IMPROVED SYSTEM FOR HEMOGLOBIN-FREE PERFUSION OF ISOLATED RAT LIVERS.

(E.) Schmucker, D. L.; Jones, A. L.; Michielsen, C. E. (San Francisco Veterans Admin. Hosp., San Francisco, Calif. 94121). *Lab. Invest.* 33(2):168-175, 1975.

A newly designed perfusion system which permits the use of hemoglobin-free perfusates at near physiologic flow rates in isolated male Sprague-Dawley rat livers is presented. The preservation of hepatic fine structure, O_2 consumption, bile secretion rate, and the retention of intracellular potassium ions were evaluated. The perfusion apparatus was composed of two identical systems each consisting of an atraumatic pulsatile pump, a hyperbaric silastic tubing oxygenator, an organ bypass manometer, a perfusate reservoir and a gas humidifier. The livers were perfused through the portal vein alone, 20 to 25 ml of perfusion medium/min at 38 C for 2 to 5 hr. The medium contained neither RBC nor O_2 carriers. The use of hyperbaric oxygenation eliminated the hemoglobin requirement of the perfusion medium. Extensive endothelial cell injury associated with the use of hemoglobin-free media was avoided since this system permits perfusion at near physiologic hepatic portal vein flow rates. In addition, hepatic fine structure was preserved for more than four hr. The quality of isolated livers perfused without albumin in the medium suggests that an oncotic agent is not required for rat liver perfusion.

8271 ALTERATIONS IN PHARMACOKINETICS OF DRUGS IN PORTACAVAL SHUNT.

(Ger.) Gugler, R.; Lain, P.; Azarnoff, D. L. (Med. Clin., Univ. Bonn, Germany). *Z. Gastroenterol.* 13(3):393-397, 1975.

Plasma concentrations of lidocaine and antipyrine were determined by gas chromatography 10 to 300 min after administration of these drugs to dogs before and 8 to 14 days after creation of end-to-side portacaval shunts. Lidocaine was administered in doses of 10 and 30 mg/kg, p.o., and 10 mg/kg, i.v., before surgery, and in 10 mg/kg doses i.v. and p.o. after surgery. Antipyrine was administered in a dose of 20 mg/kg, p.o. and i.v., before and after surgery. When plasma concentrations of lidocaine were plotted against time, the area under the curve of the p.o. administered drug was only 15% of the area under the curve for the i.v. dose. After surgery, the area under the curve for the oral dose was more than 80% of that under the curve for the comparable i.v. dose. The half-life increased significantly from 74 to 88 min and plasma clearance values decreased even more markedly. The area under the curve for 30 mg/kg lidocaine, p.o., was three times the area under the curve for the 10 mg/kg, p.o. dose, indicating that this drug is taken up by the liver in a dose-dependent manner. No significant differences were found in the plasma levels of antipyrine before and after shunt surgery. The half-life and plasma clearance values were identical, and no differences were found in the imaginary distribution volumes.

8272 THE EFFECT OF PORTACAVAL TRANSPOSITION ON HEPATIC CYTOCHROME P-450 IN THE RAT.

(E.) Pector, J. C.; Ossenberg, F. W.; Peignoux, M.; Benhamou, J. P. (Hopital Beaujon, 100 boulevard du General Leclerc, 92110 Clichy, France). *Biomedicine* 23(5):160-162, 1975.

The effects of portacaval anastomosis (performed on 30 rats) and portacaval transposition (performed on 15 rats) on colloidal radiogold fractional clearance and on the hepatic cytochrome P-450 level were compared in adult male Charles River rats. The animals were subjected to one of these two surgical procedures or were sham-operated by laparotomy and mobilization (performed on 30 rats) and, in some cases, left nephrectomy (performed on 15 rats). On the fifteenth postoperative day, colloidal radiogold ^{198}Au (5 μCi) was injected i.v. into anesthetized rats. Blood samples were taken from the carotid artery one, two, three and four min later and colloidal fractional radiogold clearance was calculated. Immediately thereafter, the animals were sacrificed and the livers were assayed for cytochrome P-450. Colloidal radiogold fractional clearance was significantly lower in the rats with portacaval anastomosis (0.556/min) than in their sham-operated controls (0.842/min), but was not significantly different in the animals with portacaval transposition (0.808/min) and in their sham-operated controls (0.798/min). Liver weight and hepatic cytochrome P-450 concentrations were also significantly lower in the rats with portacaval anastomosis (0.60 nM/mg of microsomal protein) and with portacaval transposition (0.55 nM/mg) than in the controls (0.83 nM/mg and 0.76 nM/mg, resp.). These data support the hypothesis that the decrease in hepatic cytochrome P-450 results from the deprivation of one or more substances normally supplied by portal blood that contribute to maintenance of the cytochrome level. The decreased clearance of colloidal ^{198}Au in the rats with portacaval anastomosis appeared to be due to a reduction in the liver blood flow; liver blood flow was normal in the animals with portacaval transposition.

8273 QUANTIFICATION OF THE CAPACITY OF THE LIVER TO REMOVE AMMONIA FROM THE CIRCULATION OF DOGS WITH PORTACAVAL TRANSPOSITION. *(E.)*

Aldrete, J. S. (Dept. Surgery, Univ. Alabama, Birmingham, Ala.). *Surg. Gynecol. Obstet.* 141(3):399-404, 1975.

Ten dogs with portacaval transposition were studied to quantitate the ammonia that the liver removes from circulation and to investigate the distribution of this substance before and after an exogenous ammonia load. The animals were studied by placing catheters: (1) in the hepatic and portal veins through the external jugular vein, (2) in the portal vein, and (3) in the infrarenal vena cava through the femoral vein. A catheter was also placed in the femoral artery. Blood ammonia levels in each catheter were measured before and at 15-min intervals during continuous infusion of ammonium sulfate (0.7 mg/kg for 45 min) through the infrarenal vena cava. In five of the ten dogs, the total hepatic blood flow was estimated by using a continuous infusion of indocyanine green and Fick's formula. Hepatic extraction rates of ammonia were calculated by relating blood ammonia levels in the inflow and outflow tracts of the liver to the estimated hepatic blood flow. The latter changed minimally before and after portacaval transposition. Prior to infusion, blood ammonia levels were 30 μg/100 ml of blood in hepatic veins; 100 μg/100 ml in the femoral artery and the inferior vena cava; and 200 μg/100 ml in the portal vein. The segment of portal vein anastomosed to the suprarenal infrarenal vena cava contained an average of 78 μg/100 ml more of ammonia than the infrarenal vena cava. During the 45-min infusion period, the blood ammonia levels increased by at least 90% at all sites, except in the hepatic veins, where they remained below 55 μg/100 ml. When the infusion was discontinued, the levels decreased rapidly but remained 30 to 60% higher than the preinfusion levels for at least 45 min. The liver was found to remove 80-97% of the ammonia reaching it by means of the urea cycle; the remaining ammonia is apparently passed again into the central venous circulation. It gradually accumulates throughout the vascular system as documented by the persistently elevated blood ammonia levels measured after discontinuing the ammonia load.

8274 EARLY RECOVERY OF ALBUMIN SYNTHESIS AFTER LIVER TRANSPLANTATION. *(E.)*

DeRiberolles, C.; Franco, D.; Lecompte, Y.; Blondeau, B.; Chauvaud, S.; Grange, D.; Bismuth, H. (Hôpital Paul-Brousse, Villejuif, France). *Eur. Surg. Res.* 7(3):164-169, 1975.

The length of time required for transplanted livers to become functional was studied in 20 mongrel dogs of both sexes. Bromsulphalein (BSP) plasma disappearance rate after a single injection of BSP (2.5 mg/kg) and albumin synthesis after a single i.v. injection of methionine ^{35}S were studied in normal dogs, animals which had undergone total hepatectomy 2 hr previously, and animals which had received orthotopic liver grafts 2 hr previously. BSP clearance in the transplanted dogs (0.086) was significantly lower than in the normal controls (0.247), but was significantly higher than in the hepatectomized dogs (0.030). The plasma clearance of newly synthesized albumin was similar in the transplanted and normal dogs 30, 45, and 60 min after injection of the precursor. In contrast, plasma radioactivity was significantly lower in the hepatectomized animals. The data indicate that transplanted livers recover synthesizing function soon after transplantation and that such livers would be able to support life and correct the disturbances created by liver failure and surgery after only a brief delay. The results further suggest that in the early postoperative period BSP clearance is not an accurate assessment of hepatic function.

8275 THE SOURCE OF ASCITIC FLUID IN EXPERIMENTAL CIRRHOSIS IN THE RAT. *(E.)*

Mazzacca, G.; Bianco, A. R.; Budillon, G.; Perillo, N. (Second Sch. Medicine, Univ. Naples, Naples, Italy). *Pathol. Microbiol. (Basel)* 42(1):66-69, 1975.

To disclose the source of ascitic fluid in liver cirrhosis, normal and cirrhotic (induced by CCl_4 and phenobarbitone treatment) male Wistar rats were injected with fluorescein (0.5 ml of a 5% solution infused into the paracecal vein) under anesthesia. The serosal and hepatic gut surfaces, which had been exposed prior to the fluorescein treatment, were scanned for 30 min under UV light. After scanning, the livers were removed, sliced, and stained with hematoxylin-eosin. After 12 wk of combined CCl_4-phenobarbitone treatment, the livers of 19 of the 26 surviving animals showed histologic evidence of portal cirrhosis. Although the hepatic and other peritoneal surfaces in the cirrhotic rats appeared to be wetter on laparotomy than those of the controls, and small amounts of free fluid were observed in six cirrhotic rats, abundant ascites was not detected. In the normal rats and noncirrhotic treated rats, small areas of very slight green fluorescence appeared on the surface of the liver one to two min after fluorescein injection; no fluorescence was detected on any extrahepatic area. In the cirrhotic rats without ascites, slightly more intense fluorescence appeared on the liver surface one to two min after fluorescein treatment. In comparison with the other animals, the rate of peritoneal transudation was enhanced in the rats with ascites; in addition, significant transudations were observed in areas other than the hepatic surface. The results indicate that both the liver and visceral peritoneum are sources of ascites in cirrhosis; the liver is also an important source of ascitic fluid in the normal state.

8276 PEROXISOME DEPLETION IN RAT LIVER DURING PNEUMOCOCCAL SEPSIS. *(E.)* Canonico, P. G.; White, J. D.; Powanda, M. C. (U.S. Army Medical Res. Inst. of Infectious Diseases, Frederick, Md. 21701). *Lab. Invest.* 33(2):147-150, 1975.

The effects of pneumococcal sepsis on the number of hepatic peroxisomes and the activity of catalase and urate oxidase were studied in male Fisher-Dunning rats. The animals were inoculated s.c. with 10^6 *Diplococcus pneumoniae,* serotype I organisms. Liver homogenates were prepared at selected intervals following inoculation. The distribution of enzymatic activity was studied after isopycnic zonal centrifugation. Peroxisomal and endoplasmic reticular contents of liver parenchymal cells were analyzed by electron microscopic morphometry. Infected rats became febrile by 18 hr postchallenge and bacteremic by 24 hr; death usually occurred after 52 to 56 hr. Peroxisomal enzymatic activities decreased significantly 24 hr postinoculation. The value of catalase and urate oxidase fell to 16% and 28%, resp., of the control values by 48 hr. Infection did not alter the intracellular distribution of these enzymes. The activities of several liver mitochondrial, cytoplasmic, and lysosomal enzymes were unchanged during bacterial sepsis. Analysis of the peroxisomal content of the liver parenchymal cells confirmed a substantial decrease (from 52.9×10^9 peroxisomes/cm^3 for the controls to $25.4 \times 10^9/cm^3$ in experimental livers) in peroxisome-like organelles by 24 hr postinfection. It is suggested that during some bacterial infections, the hepatic synthesis of acute-phase serum proteins occurs at the expense of peroxisomal protein synthesis, resulting in a reduction in the peroxisomal protein pool and in the number of peroxisomes.

8277 IMMUNOPATHOLOGY OF MOUSE HEPATITIS VIRUS TYPE 3 INFECTION. III. CLINICAL AND VIROLOGIC OBSERVATION OF A PERSISTENT VIRAL INFECTION. *(E.)* Le Prevost, C.; Virelizier, J. L.; Dupuy, J. M. (INSERM U 56, Hopital d'Enfants, F 94270 Bicetre, France). *J. Immunol.* 115(3):640-643, 1975.

The clinical and virologic observations in mice developing chronic disease following infection with mouse hepatitis virus type 3 (MHV3) are reported. The clinical evolution in C3H mice infected with MHV3 was age-dependent. Mice of six weeks or less were highly susceptible and died within a week, maximal resistance was observed in 10 to 15-week-old animals, and mortality increased to about 50% after six months of age. Three weeks after infection, both the male and female surviving mice developed a chronic disease characterized by a wasting syndrome and later by uncoordination, progressive paralysis, and death. When a variety of other strains were tested, the CBA, AKR, I, $(A/J \times DBA/2)F_1$, and $(A/J \times C57BL/6)F_1$ hybrids showed the same pattern of viral sensitivity as the C3H strain. In contrast, strain A/J animals were resistant at both six and 12 weeks of age while strains BALB/c, NZB, B10.D2-old, C57BL/6, and DBA/2 were susceptible at both six and 12 weeks of age. Among the semisusceptible strains, such as C3H, paralysis occurred in most of the surviving animals. Twenty-six and 42 days post-infection, virus was recovered from the liver, brain, spleen, and lymph nodes of a large number of paralyzed C3H mice. The viral infection was persistent despite consistently low virus titers. The titers of viral suspensions prepared from the liver or serum of six-month-old mice four days after MHV3 infection were intermediate between those observed in DBA/2 mice and those observed in paralyzed C3H animals. The clinical evolution in six-month-old C3H mice injected with MHV3 was correlated with the titer of virus tested four days after infection. It is suggested that in chronically infected mice, the reticuloendothelial system harboring the virus might undergo passive damage leading to immunologic disturbances and to irreversible destruction of the nervous tissue.

8278 BILE ACIDS INHIBIT LYSOZYME ACTIVITY [abstract]. *(E.)* Ghoos, Y.; Vantrappen, G.; Peters, T. (Dept. Med. Res., Univ. Leuven, Leuven, Belgium). *Gut* 16(5):394, 1975.

8279 ENTRY OF ^{14}C-ERYTHRITOL AND ^{3}H-MANNITOL INTO PANCREATIC AND BILIARY SECRETIONS AND THE EFFECT OF SECRETIN IN THE RAT [abstract]. *(E.)* Smith, N. (Dept. Med., Univ. Chicago, Chicago, Ill.). *Gastroenterology* 68(4):1092, 1975.

8280 BILE ACID BIOSYNTHESIS: THE METABOLISM OF 7α-HYDROXY-4-CHOLESTEN-3-ONE IN THE BILE FISTULA RAT [abstract]. *(E.)* Sherman, C. A. (Univ. Minnesota Hosp., Minneapolis, Minn.). *Gastroenterology* 68(4):1092, 1975.

8281 BILE SALTS ARE NOT NECESSARY FOR STEROL MICELLIZATION [abstract]. *(E.)* Cooperstein, L. A.; Little, J. M.; Dowd, S. R.; Lester, R.; Carey, M. C. (Dept. Med., Univ. Pittsburgh, Pittsburgh, Pa.). *Gastroenterology* 68(4):1089, 1975.

8282 PROCOLLAGEN BIOSYNTHESIS BY FIBROTIC RAT LIVER SLICES [abstract]. *(E.)* Rojkind, M. (Centro de Investigacion del IPN, Apartado Postal 14-740, Mexico 14, D. F.). *Gastroenterology* 68(4): 1083, 1975.

8283 AN IN VITRO APPROACH TO ALCOHOLIC LIVER DISEASE: INHIBITION OF TISSUE CULTURE CELL GROWTH BY LOW CONCENTRATIONS OF ETHANOL [abstract]. *(E.)* Miller, Jr., J. V. (Univ. New Mexico Sch. Med., Albuquerque, New Mexico). *Gastroenterology* 68(4):1081, 1975.

8284 THE PROCESS OF CHOLESTEROL CHOLELITHIASIS INDUCED BY DIET IN THE PRAIRIE DOG: A PHYSICOCHEMICAL CHARACTERIZATION [abstract]. *(E.)* Holzbach, R. T.; Corbusier, C.; Marsh, M.; Naito, H. K. (Cleveland Clin. Found., Cleveland, Ohio). *Gastroenterology* 68(4):1077, 1975.

8285 STUDY OF THE STIMULATION OF THE BILE SALT NON-DEPENDENT FRACTION OF CANALICULAR BILE WATER (BSNDF) BY PHENOBARBITAL [abstract]. *(E.)* Gumucio, J. J.; Balabaud, C.; Gray, R. H.; Kline, A. J. (Sch. Public Health, Univ. Michigan, Ann Arbor, Mich.). *Gastroenterology* 68(4):1077, 1975.

8286 BRAIN ENERGY METABOLISM IN ACUTE HEPATIC COMA [abstract]. *(E.)* Biebuyck, J. E.; Funovics, J. M.; Dedrick, D. F.; Fischer, J. E. (Harvard Med. Sch., Boston, Mass.). *Gastroenterology* 68(4):1073, 1975.

8287 HEPATIC CHOLESTEROL (CH) ESTERIFICATION: A POSSIBLE DETERMINANT OF HEPATIC CH EXCRETION [abstract]. *(E.)* Davis, R. A.; Lutz, W. T.; Kern, Jr., F. (Univ. Colorado Sch. Med., Denver, Colo.). *Gastroenterology* 68(4):1072, 1975.

8288 ALKALINE PHOSPHATASE IN LYMPH AND SERUM AFTER BILE DUCT LIGATION [abstract]. *(E.)* Hauser, S.; Baker, A. (Dept. Med., Univ. Chicago, Chicago, Ill.). *Gastroenterology* 68(4):1068, 1975.

8289 INCREASED SULFATION AND DECREASED 7α-HYDROXYLATION OF DEOXYCHOLIC ACID (DCA) IN ETHINYL ESTRADIOL (EE) INDUCED CHOLESTASIS IN RATS [abstract]. *(E.)* Jensen, R.; Davis, R.; Kern, Jr., F. (Univ. Colorado Med. Cent., Denver, Colo.). *Gastroenterology* 68(4):919, 1975.

8290 ACTIVATION OF CYCLIC-AMP STIMULATED PROTEIN KINASE IN THE PERFUSED RAT LIVER. RELATION TO GLUCONEOGENESIS [abstract]. *(E.)* Friedmann, N. (Univ. Texas Med. Sch., Houston, Texas). *Gastroenterology* 68(4):895, 1975.

8291 VITAMIN B_{12} ANALOG PRODUCTION IN THE EXPERIMENTAL BLIND LOOP [abstract]. *(E.)* Brandt, L. J.; Bernstein, L. H.; Efron, G.; Wagle, A. (Montefiore Hosp., Bronx, N. Y.). *Gastroenterology* 68(4):863, 1975.

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8350 EFFECT OF FASTING, URIDINE-DIPHOSPHATE-GLUCOSE (UDPG), AND PHENOBARBITAL (PB), ON HEPATIC AND EXTRAHEPATIC GLUCURONYL TRANSFERASE (GT) ACTIVITY IN SPRAGUE-DAWLEY RATS [abstract]. *(E.)* Scremin, S.; Asquini, A.; Okolicsanyi, L. (Istituto di Patologia Medica dell' Universita, Padova, Italy). *Rend. Gastroenterol.* 6(3):219, 1974.

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See also, 8044, 8202, 9029, 9071, 9072, 9171, 9317, 9387.

SECRETION AND METABOLISM

Intestine

8353 CONTROL OF DEOXYRIBONUCLEIC ACID SYNTHESIS IN NORMAL RABBIT COLONIC MUCOSA. *(E.)* Alpers, D. H.; Philpott, G. W. (Washington Univ. Sch. Medicine, 660 South Euclid Ave., St. Louis, Mo. 63110). *Gastroenterology* 69(4):951-959, 1975.

The influence of modifiers of cyclic AMP (cAMP) levels on DNA synthesis in white New Zealand rabbit colonic mucosa was studied in short-term organ culture. Midsigmoid colon sections were cultured. Base line studies showed that the incorporation of

[^{3}H]thymidine into DNA was linear for 24 hr and occurred mainly in mucosal cells, as demonstrated by autoradiography. Right colon explants consistently had less DNA synthetic activity per mg of total protein than left colon explants. A gradient in the amount of DNA synthesis was observed; it was lowest in the cecum and increased to a maximum (3-fold greater) at the splenic flexure. The pattern was eliminated by a 48 hr fast, at which time no formed stool remained in the colon. Intracellular cAMP modifiers depressed colonic DNA synthesis. Theophylline added to explants inhibited DNA synthesis by 35% at 0.5 mM and increased intracellular cAMP levels (at 5 mM theophylline, cAMP was increased from 19.4 ± 4.8 pM/mg to 40.6 ± 2.5 pM/mg of protein). The inhibition was not observed until ten hr after theophylline addition and was partly reversible. N^6,0^2-dibutyl cAMP inhibited DNA synthesis at 0.025 mM. Adenosine and sodium butyrate were ineffective up to 1.0 mM concentrations. 5'-AMP did not inhibit DNA synthesis, but elevated intracellular cAMP levels at concentrations less than 0.1 mM. Other ineffective cAMP modifiers were prostaglandins E$_1$, E$_2$, F$_2\alpha$ (2 x 10^{-6} M), and papaverine (1 µM). Thymidine uptake was unaffected by these drugs. The intrinsic thymidine pool, estimated at 20 µM by isotope dilution, was not altered by theophylline. It is concluded that DNA synthesis in rabbit colon can be suppressed by increased cAMP levels within a short-term organ culture. The drugs which elevated cAMP levels did not suppress DNA synthesis by decreasing intracellular thymidine concentrations.

8354 UPTAKE, ACTIVATION, AND ESTERIFICATION OF FATTY ACIDS IN THE SMALL INTESTINE OF THE SUCKLING RAT.

(E.) Holtzapple, P. G.; Smith, G.; Koldovsky, O. (Univ. Pennsylvania Sch. Medicine, Philadelphia, Pa.). *Pediatr. Res.* 9(10):786-791, 1975.

Microsomal preparations of jejunum and ileum from fetal, one-day, three-day, five-day, and 10-day-old Charles River rats were studied for the activity of oleoyl-CoA synthetase and acyl-CoA:monoglyceride acyltransferase, and jejunal slices from 6 or 11-day-old and adult rats were studied for uptake and esterification of oleic acid. The jejunal activity of microsomal oleoyl-CoA synthetase fell from a fetal value of 240 nM product/mg protein/min to 40 on day one, then leveled by day three to 160, which was not significantly different from adult values, while that of acyl-CoA:monoglyceride acyltransferase increased from a fetal value of 40 nM product/mg protein/min to 210 at 12 days, then fell to adult values of 120. Ileal activity of oleoyl-CoA synthetase remained low into adult life, while that of acyl-CoA:monoglyceride acyltransferase peaked at 180 nM product/mg protein/min on day 12, then gradually fell to adult levels. The rate of oleic acid uptake was faster in jejunal slices from six-day-old rats (2000 mM oleic acid/g wet tissue/15 min at 0 C) than those from adult rats (500 nM/g/15 min at 0 C). Likewise, esterification occurred at faster rates in six-day-old rats (1000 nM oleic acid converted to triglyceride/g wet tissue/5 min at 37 C) than in adults (400 nM/g/5 min at 37 C), so that the ratio of the two (uptake/conversion) remained constant. This indicates that the availability of free fatty acid is one factor responsible for the increased rate of esterification at this age.

8355 LACTATE FORMATION BY RAT SMALL INTESTINE IN VITRO.

(E.) Leese, H. J.; Bronk, J. R. (Dept. Biology, Univ. York, York Y01 5DD, U.K.). *Biochim. Biophys. Acta* 404(1):40-48, 1975.

The formation of lactic acid by mucosal slices, jejunal rings and strips of the underlying smooth muscle of the rat jejunum was studied. Specimens were incubated in a modified Krebs-Ringer bicarbonate solution for short periods (8 min or less). Samples of the incubation medium were taken at intervals for the determination of lactate by the automated fluorometric method. When mucosal slices were incubated in the absence of glucose or when K$^+$ completely replaced Na$^+$ in the medium, there was a rapid initial release of lactate followed by a slow rise in the lactate content of the medium. Approximately twice as much lactate was liberated in the Na$^+$ medium as in the K$^+$ medium. The addition of glucose (11.1 mM) after a 30-sec preincubation initiated a short period of rapid lactate release into the normal Na$^+$-containing medium (lasting about 30 sec) that was followed by a steady rise in the lactate concentration, greater in magnitude (24 µM/g dry weight) than in the corresponding period in the absence of glucose (7.0 µM/g dry weight). In the high K$^+$ medium, over four times as much lactate was formed in the presence of glucose (9.7 µM/g dry weight) than in its absence (2.3 µM/g dry weight), but less than was produced in the Na$^+$ medium. The time course of lactate release suggested a negative Pasteur effect of mucosal slices, which was not reversed by the addition of ADP (1 mM) or glucose-6-phosphate (11.1 mM). By contrast, the rate of lactate formation by rings and muscle from rat jejunum increased steadily over the incubation period (more pronounced in the rings than in the muscle), indicating a positive Pasteur effect. The values for tissue lactate content indicated that about three-quarters of the lactate released into the medium during the first 30 sec was present in the tissue initially. These results illustrate the danger of assuming from *in vitro* studies that the capacity of the intestine to produce a particular metabolite is the sum of the capacities of its individual parts. The time course of lactate formation by jejunal rings could not be predicted from the data obtained with mucosal and muscle layers separately.

8356 EFFECT OF DIOCTYL SODIUM SULFOSUCCINATE ON COLONIC FLUID AND ELECTROLYTE MOVEMENT.

(E.) Donowitz, M.; Binder, H. J. (Dept. Internal Medicine, Yale Univ., New Haven, Conn. 06510). *Gastroenterology* 69(4):941-950, 1975.

The effect of dioctyl sodium sulfosuccinate (DSS) on intestinal fluid and electrolyte movement was studied *in vivo* in fasted (18 hr) male Sprague-Dawley rats and *in vitro* with rat colonic mucosa in a modified Ussing chamber. *In vivo*, DSS induced secretion of water and sodium, increased HCO_3 secretion, and decreased chloride absorption in the rat cecum. The secretory phenomenon was dose-related: 1 mM DSS had no effect while maximal effect was observed at 4 mM. The secretion was rapidly reversible; normal absorptive rates were present in the three-hr period immediately following replacement of DSS with isotonic saline solution. *In vitro*, 0.5 mM of DSS induced a prompt increase in both short circuit current and potential difference and diminished sodium absorption. The increase in short circuit current was not observed when HCO_3 or chloride were absent from the incubation solution or when theophylline was present. In addition, it was found that DSS also significantly increased mucosal cyclic AMP levels. These results support the hypothesis that DSS stimulates fluid and electrolyte secretion, which is mediated by increased mucosal cyclic adenosine 3':5' monophosphate.

8357 EFFECT OF DIET ON ENZYMES OF THE BRUSH BORDER OF THE SMALL INTESTINE AND KIDNEY OF RATS.

(E.) Saito, M.; Suda, M. (Sch. Medicine, Ehime Univ., Matsuyama, Ehime, Japan). *J. Nutr. Sci. Vitaminol.* 21(3):207-215, 1975.

The effects of dietary casein and starch on the peptide-hydrolyzing enzymes of the small intestinal brush border were studied in male Wistar rats. The animals were maintained for five days on diets containing 5 to 91 g casein/100 g diet and 0 to 71 g starch/100 g diet. They were then killed and the small intestinal mucosa was homogenized and assayed for protein, leucineaminopeptidase, maltase, and glucose. Diets with low starch and high casein contents resulted in higher specific leucineaminopeptidase activities in the small intestine than did diets with high starch and low casein content. Diets high in starch and low in casein increased the specific activity of maltase, however. Rat small intestine contains at least two isoenzymes of leucineaminopeptidase: one bound to the brush border and the other not bound to it but recoverable in the soluble fraction. Only the former was influenced by the diets fed. The maximum velocity of leucineaminopeptidase bound to the brush border during DEAE-cellulose column chromatography was twice as high in the rats on high casein diets as in those on low casein diets, but the Michaelis constant was approximately the same in both groups. The leucineaminopeptidase and maltase activities in the kidney were not influenced by diet. The results suggest that the mechanisms of regulation of maltase and leucineaminopeptidase are different, and that the metabolic regulation of the epithelial cells in the kidney is quite different from that of the cells in the small intestine.

8358 THE EFFECTS OF PHYTATE ON INTESTINAL ABSORPTION AND SECRETION OF ZINC, AND WHOLE-BODY RETENTION OF Zn, COPPER, IRON AND MANGANESE IN RATS.

(E.) Davies, N. T.; Nightingale, R. (Rowett Res. Inst., Bucksburn, Aberdeen AB2 9SB, Scotland). *Br. J. Nutr.* 34(2):243-258, 1975.

Groups of male Hooded Lister rats (Rowett Institute strain) were fed regular diets supplemented with 15 mg/kg Zn, 15 mg/kg Zn + 10 g/kg phytate, 0.5 mg/kg Zn, or 0.5 mg/kg Zn + 10 g/kg phytate for 21 days to study the effect of phytate on Zn utilization. Isolated loops of duodenum injected with 5.07 μM phytic acid were subsequently injected with 0.2 ml saline containing 5 μg Zn (0.1 μCi ^{65}Zn) to study the effect of phytate on reabsorption of endogenously secreted Zn. From the fourth day phytate-fed rats showed a marked reduction in weight gain (cumulative weight gain at 21 days: 140 g, control; 30 g, phytate-fed). Of those fed 15 mg/kg Zn diets, phytate-fed rats and pair-fed control rats had calculated mean Zn absorption values of 25.3 and 53.2 μg Zn absorbed/day, resp. On 0.5 mg/kg Zn, there was a net loss of Zn with values of 0.87 and 7.6 μg Zn loss/day for control and phytate-fed rats, resp. In ligated duodenal loops, phytate reduced the binding and absorption of Zn so that the total mucosal uptake of Zn was 0.76 μg Zn/loop/15 min in phytate-injected loops. These results support previous findings that phytate reduces Zn utilization. It is suggested that since more than 80% luminal Zn in phytate-injected loops was in suspended particulate form, Zn is unavailable for absorption due to co-precipitation with Ca and phytate.

8359 INTERACTION OF CHOLERA TOXIN AND MEMBRANE G_{M1} GANGLIOSIDE OF SMALL INTESTINE.

(E.) Holmgren, J.; Lonnroth, I.; Mansson, J. E.; Svennerholm, L. (Inst. Medical Microbiology, Univ. Goteborg, Goteborg, Sweden). *Proc. Natl. Acad. Sci. USA* 72(7): 2520-2524, 1975.

The binding properties of *Vibrio cholerae* toxin to intestinal mucosa cells and the relation of these properties to the mucosal content of galactosyl-*N*-acetylgalactosaminyl-(sialyl)-galactosylglucosylceramide (G_{M1}) ganglioside were studied. Ganglioside G_{M1} was isolated from human, porcine, and bovine small intestinal mucosa in amounts corresponding to 0.1, 2.0, and 43 nM/g fresh weight, resp. These differences in G_{M1} content were associated with a quantitatively different ability of mucosal cells to bind cholera toxin. When saturated with 50 U/ml toxin, human cells bound 15,000 toxin molecules/cell, the porcine cells--120,000 molecules/cell, and the bovine cells--2,600,000 molecules/cell. For cells of all three species, the association constant (K_A) of the cholera toxin binding was about 10^9 liters/M. Exogenously added G_{M1} ganglioside was incorporated in intestinal mucosal cells as well as in intact rabbit small intestine. Incubation of intestinal cells with G_{M1} ganglioside (0.07-2 μM) did not alter K_A values but resulted in a concentration-dependent increase in the number of receptors for toxin on human and porcine mucosal cells, and in segments of rabbit small intestine; the effect was much less on the G_{M1}-rich bovine cells. G_{M1} incorporation increased the sensitivity of the rabbit small intestine to the diarrheogenic action of 0.1 and 1.0 mg cholera toxin. *V. cholerae* sialidase (10 U/ml) hydrolyzed isolated intestinal di- and trisialogangliosides to G_{M1}. However, the enzyme did not change the ganglioside pattern of intestinal mucosa, had very little influence on the number of toxin binding sites on intestinal cells, and did not alter the sensitivity of the small intestine to the diarrheogenic action of the toxin. These results demonstrate a relation in the intestinal mucosa between the G_{M1} ganglioside concentration, the number of binding sites for cholera toxin, and the sensitivity to the biologic action of the toxin. These data strongly support the concept that the G_{M1} ganglioside is the intestinal binding receptor for cholera toxin.

8360 STUDIES ON THE PEYER'S PATCHES OF GERM-FREE AND CONVENTIONAL MICE IMMUNOGLOBULIN BY SYNTHESIS IN VITRO [abstract]. *(E.)* McClelland, D. B. L. (Univ. Hosp., Leiden, The Netherlands). *Gut* 16(5):402, 1975.

8361 RELEASE OF SECRETIN FROM S CELLS OF PORCINE DUODENUM AND JEJUNUM BY ACID [abstract]. *(E.)* Joffe, S. N.; Bloom, S. R.; Polak, J. M.; Welbourn, R. B. (R. Postgrad. Med. Sch., London, England). *Gut* 16(5):398, 1975.

8362 SELECTIVE INHIBITION OF BICARBONATE SECRETION IN THE PERFUSED RAT COLON DURING HEMORRHAGIC SHOCK [abstract]. *(E.)* Noel, D.; Sicotte, C. (Centre Hospitalier Universitaire, Sherbrooke, Quebec, Canada). *Gastroenterology* 68(4):1090, 1975.

8363 EFFECT OF CHOLERA TOXIN (C.T.) ON RABBIT JEJUNAL GLYCOLYTIC (GLY) AND GLUCONEOGENETIC ENZYMES [abstract]. *(E.)* Sherr, H. P.; Stifel, F. B.; Herman, R. H. (Army Res. Nutr. Lab., Denver, Colo.). *Gastroenterology* 68(4):984, 1975.

8364 CYTOCHROME P-450 IN DUODENAL MUCOSA: DEPENDENCE ON DIETARY (LUMINAL) IRON [abstract]. *(E.)* Hoensch, H. P.; Woo, C. H.; Schmid, R. (Dept. Med., Univ. California, San Francisco). *Gastroenterology* 68(4):912, 1975.

8365 CHARACTERISTICS OF RELEASE OF DUODENAL GASTRIN [abstract]. *(E.)* Wesdorp, R. I. C.; Funovics, J. M.; Hirsch, H.; Fischer, J. E. (Harvard Med. Sch., Boston, Mass.). *Gastroenterology* 68(4):892, 1975.

8366 MECHANISM OF BILE ACID DIARRHEA: THE ROLE OF CYCLIC AMP IN COLONIC SECRETION [abstract]. *(E.)* Conley, D. R.; Coyne, M. J.; Chung, A.; Bonorris, G. G.; Schoenfield, L. J. (Cedars-Sinai Med. Cent., Los Angeles, Calif.). *Gastroenterology* 68(4):877, 1975.

8367 EFFECT OF PLANT LECTINS ON THE BINDING OF HUMAN INTRINSIC FACTOR-VITAMIN B_{12} COMPLEX (IF-B_{12}) TO ISOLATED GUINEA PIG BRUSH BORDER MEMBRANES (BBM) [abstract]. *(E.)* Boedeker, E. C.; Boldt, D. H. (Walter Reed Inst. Res., Washington, D. C.). *Gastroenterology* 68(4):866, 1975.

8368 BIOSYNTHESIS OF LIPOPROTEINS BY INTESTINAL EPITHELIUM, SITE OF SYNTHESIS AND SEQUENCE OF ASSOCIATION OF LIPID, SUGAR AND PROTEIN MOIETIES [abstract]. *(E.)* Kessler, J. I.; Narcessian, P.; Mauldin, D. P. (R. Victoria Hosp., Montreal, Canada). *Gastroenterology* 68(4):1058, 1975.

8369 THE DIFFERING EFFECTS OF PROTEASES IN ENZYMES OF HUMAN INTESTINAL MICROVILLUS MEMBRANE [abstract]. *(E.)* Seetharam, B.; Goodwin, D.; Grimme, N.; Alpers, D. H. (Washington Univ. Sch. Med., St. Louis, Mo.). *Gastroenterology* 68(4):1053, 1975.

8370 EFFECT OF LARGE DOSES OF VITAMIN B_{12} ON INTESTINAL MICROFLORA. *(Rus.)* Villako, K. P.; Tamm, A. O. (Dept. Propedeutic Internal Diseases, Tartu Univ., Tartu, USSR). *Ter. Arkh.* 47(2):118-121, 1975.

8371 STRUCTURAL REQUIREMENTS FOR THE INTERACTION OF THE HORMONALLY ACTIVE FORM OF VITAMIN D, 1α, 25-$(OH)_2$-D_3, WITH ITS INTESTINAL RECEPTOR SYSTEM. *(E.)* Procsal, D.; Norman, A. W. (Dept. Biochem., Univ. California, Riverside, Calif.). *Fed. Proc.* 34(3):894, 1975.

8372 THE FATE OF ACID IN THE RABBIT'S JEJUNUM [abstract]. *(E.)* Chung, R. S. K.; Johnson, G.; DenBesten, L. (Univ. Iowa Coll. Med., Iowa City, Iowa). *Clin. Res.* 23(3):247A, 1975.

8373 THE INFLUENCE OF CHOLINOCEPTOR ACTIVITY ON THE MITOTIC RATE IN THE CRYPTS OF LIEBERKUHN IN RAT JEJUNUM. *(E.)* Tutton, P. J. M. (Dept. Anatomy, Monash Univ., Clayton, Victoria, Australia). *Clin. Exp. Pharmacol. Physiol.* 2(3):269-276, 1975.

8374 METABOLISM OF NUCLEIC ACIDS IN CELLS OF INTERNAL ORGANS OF ANIMALS WITH INTESTINAL HIGH FISTULAE. *(Rus.)* Chkheidze, R. D. (Tiflis State Inst. Med., USSR). *Soobshch. Akad. Nauk Gruz. SSR).* 77(2):477-480, 1975.

8375 ENZYME ACTIVITY OF THE RAT'S SMALL INTESTINAL MUCOSA DURING REPEATED EXPOSURE TO HIGH AMBIENT TEMPERATURES. *(Rus.)* Rakhimov, K.; Demidova, A. I. (Dept. Physiology, Uzbek Acad. Science, Tashkent, USSR). *Fiziol. Zh.* 61(5):778-784, 1975.

8376 STUDIES ON HYDROLYSIS OF PHOSPHOLIPIDS IN RAT SMALL INTESTINAL SMOOTH MUSCLE. *(Jpn.)* Kudoh, N. (Dept. Surgery Section I, Sapporo Medical Coll., Sapporo, Japan). *Sapporo Igaku Zasshi* 43(2):121-133, 1974.

8377 ENZYMO-SECRETORY MUCOSAL FUNCTION OF THE SMALL INTESTINE IN EXPERIMENTAL ACUTE PANCREATITIS. *(Rus.)* Redchits, P. S. (Dept. Surgery, Odessa Inst. Lab. Biochemistry, USSR). *Patol. Fiziol. Eksp. Ter.* 616(2):74-75, 1975.

8378 HISTOENZYMATIC INVESTIGATIONS ON THE ADAPTATION PROCESS OF VILLI IN THE REMAINING SEGMENT OF SMALL INTESTINE AFTER EXTENSIVE RESECTION OF THIS INTESTINE. *(Pol.)* Gawronski, M.; Mastynska, M.; Dworak, Z.; Kadlubowska, M.; Stajgis, P. (Dept. of Pathological Anatomy, Inst. of Biostructure of the Medical Acad., Poznan, Poland). *Pol. Przegl. Chir.* 47(5):605-611, 1975.

8379 ELABORATION OF MODELS OF EXPERIMENTAL ULCERATIVE AFFECTION [SIC] OF THE LARGE INTESTINE. *(Rus.)* Abdullaev, N. K.; Latipov, A.; Sysoeva, S. A. (Lab. Pathophyiology, Scientific Res. Inst. Rural Medicine Ministry Public Health Uzbek SSR, Tashkent, USSR). *Patol. Fiziol. Eksp. Ter.* 616(2):81-84, 1975.

See also, 8030, 8038, 8040, 8043, 8129, 8131, 8168, 8278.

GENERAL

8380 COMPARISON OF GASTRIC MUCOSAL BLOOD FLOW AS DETERMINED BY AMINOPYRINE CLEARANCE AND γ-LABELED MICROSPHERES. *(E.)* Archibald, L. H.; Moody, F. G.; Simons, M. A. (Univ. Utah Sch. Medicine, Salt Lake City, Utah 84132). *Gastroenterology* 69(3):630-634, 1975.

The gastric mucosal blood flow of anesthetized dogs prepared with a chambered segment of the stomach greater curvature was measured simultaneously by aminopyrine clearance and γ-labeled microspheres (15 ± 5 μ). In 11 dogs paired flow measurements were made of secretion in response to i.v. histamine (1 μg/kg/min). Similar measurements were made in 11 nonsecreting dogs given i.v. isoproterenol (0.5 or 1.0 μg/kg/min) and in nine dogs given no drugs to stimulate secretion of blood flow. Various combinations of isoproterenol and histamine were given in eight injections to additional dogs. During all experiments isotonic HCl was maintained on the mucosal surface. A highly significant linear correlation between clearance and microsphere-measured flow in histamine and isoproterenol experiments was demonstrated by regression analysis. Clearance averaged 83% of microsphere flow during histamine stimulation but only 25% during isoproterenol stimulation. The relation between clearance and microsphere flow was not significantly different for resting and isoproterenol experiments. Measured by microspheres, the mucosal perfusion was about five times the resting value for both histamine and isoproterenol-stimulated dogs. Perfusion calculated from aminopyrine clearance averaged 46, 38, and 90% of the microsphere value in the resting, isoproterenol, and histamine experiments, resp. A constant ratio of microsphere-measured flow to clearance (1.25) existed regardless of the secretory rate. The results indicate that aminopyrine clearance reflects only a small fraction of mucosal blood flow in the nonsecreting stomach, even in the presence of exogenous acid.

8381 SYNAPTIC POTENTIALS RECORDED FROM NEURONES OF THE SUBMUCOUS PLEXUS OF GUINEA-PIG SMALL INTESTINE. *(E.)* Hirst, G. D. S.; McKirdy, H. C. (Dept. Physiology, Monash Univ., Clayton, Victoria, Australia). *J. Physiol. (Lond.)* 249(2): 369-385, 1975.

Submucous neurons (211) prepared from middle portions of guinea pig small intestine and 23 other submucous neurons that had been extrinsically denervated 10 to 15 days earlier were studied to examine excitatory synaptic potentials (esp) and inhibitory synaptic potentials (isp) in guinea pig submucous plexuses. Single transmural stimuli initiated esp in all neurons studied. Recruitment of esp occurred as stimulator voltage increased from 11 to 37 V. In 89 of 211 neurons, a single stimulus initiated a 1 to 5 sec hyperpolarization in addition to the esp. With the addition of 10^{-4} g/ml of tubocurarine, the esp was blocked and the isp could be examined. By passing inward current through the recording electrode, the polarity of isp could be reversed (equilibrium potential required was 20-40 mV more negative than resting potential). Removal of K^+ from the bath increased the isp amplitude (amplitude initiated by paired stimuli was 16-43 mV). Nine of 23 extrinsically denervated submucous neurons demonstrated isp. Atropine (10^{-6} g/ml) and bicculine (10^{-6} g/ml) had no effect on isp. Guanethidine (10^{-5} g/ml) and 2-bromo-o-lysergic acid (10^{-6} g/ml) abolished isp without having any effect on esp. It is suggested that most submucosal plexus neurons receive extensive excitatory input and many receive inhibitory input. The esp is probably mediated by acetylcholine and isp may be mediated by adrenergic substances released by intrinsic nerves.

8382 NEURAL CONTROL OF GASTRIC MUCOSAL BLOOD FLOW IN THE RAT. *(E.)* Guth, P. H.; Smith, E. (VA Wadsworth Hosp. Cent., Los Angeles, Calif.). *Gastroenterology* 69(4):935-940, 1975.

The mechanisms by which sympathetic nerve stimulation reduces gastric mucosal blood flow and parasympathetic nerve stimulation increases it were studied in fasted male Wistar rats. An *in vivo* microscopy technique was used in sodium pentobarbital-anesthetized rats to directly visualize the gastric microcirculation during left splanchnic nerve and vagal nerve stimulation. A Narco square-wave stimulator with silver electrodes was used for nerve stimulation, and during vagal nerve stimulation, the submucosa was continuously superfused with norepinephrine (0.04-0.4 μg/min). The average control diameter of the submucosal arterioles was 21.6 μm. Stimulation of the left splanchnic nerve (8 volts, 2 to 5 millisec impulses, 10 impulses/sec) for 3 min caused an initial vasoconstriction (maximum 69.2% of control values) followed by partial escape (mean 89.8% of control values) in all animals. The mean time from onset of stimulation to maximum vasoconstriction and to maximum escape was 37.3 and 87.4 sec, resp. No arteriovenous anastomoses were seen either in the resting state or during nerve stimulation. Mucosal studies with splanchnic stimulation revealed an initial progressive slowing of flow in the capillaries, followed by partial escape. There were no significant differences between the times to maximum initial circulatory change in the submucosa and mucosa, or between the times to maximum escape in the submucosa and mucosa. In 45 of 51 episodes of vagal nerve stimulation (8 volts, 2 millisec impulses, 6 impulses/sec) in 11 rats, the submucosal arterioles dilated within 10 sec of the beginning of stimulation, and in 45 of 51 episodes, the arterioles decreased in diameter within 10 sec of the cessation of stimulation. These changes were highly significant. The average dilation was 10.8% above the diameter during norepinephrine superfusion alone. The results indicate that, in the rat, sympathetic stimulation decreases mucosal blood flow through a constricting effect on the supplying submucosal arterioles and not through the opening of "shunts." They also suggest a direct vasodilating effect of vagal stimulation on the gastric submucosal arterioles.

8383 DISTRIBUTION OF BLOOD FLOW IN THE INTESTINE WITH HYPERTONIC GLUCOSE IN THE LUMEN.

(E.) Yu, Y. M.; Yu, L. C. C.; Chou, C. C. (Depts. Physiology and Medicine, Michigan State Univ., East Lansing, Mich.). *Surgery* 78(4):520-525, 1975.

Loops of jejunum exteriorized in mongrel dogs were divided into three segments and the effect of luminal placement of 50% glucose (D50) on blood flow distribution within the wall was studied using radioactive microspheres. Two series of experiments were performed: in series I, 10 dogs received 10 ml of polyethylene glycol (PEG) in one segment, 10 ml D50 in the second, and the third remained empty; in series II, eight dogs had one segment pretreated for 20 min with 10 ml of 0.4% dibucaine, then 10 ml of D50 injected into this and the second segment, and 10 ml PEG into the third. After 20 min for equilibration, ^{141}Ce and ^{85}Cr labeled microspheres (15 μ diameter) were injected into the left ventricle three min apart. Dogs were sacrificed a few minutes later, and the mucosa, submucosa, and muscle-serosa were separated. Mucosal blood flow was significantly increased in jejunal segments containing D50 (78.7% by ^{141}Ce and 80.3% by ^{85}Sr) as compared to the empty segment (70.1% by ^{141}Ce; 67.6% by ^{85}Sr) and PEG-containing segment (67.3% by ^{141}Ce; 67.6% by ^{85}Sr). Dibucaine pretreatment reduced the hyperemic effect of D50 (whole wall radioactivity: 10171 cpm with D50; 7105 cpm with D50 and dibucaine pretreatment), but flow remained elevated over controls (4301 cpm with PEG). This study indicates that the hyperemic effect of D50 is confined to the mucosal layer and suggests that this effect is due both to a direct effect of hypertonicity on the vasculature and an effect mediated by mucosal nerves.

8384 PHARMACOLOGIC EFFECTS OF GASTROINTESTINAL HORMONES ON INTESTINAL OXYGEN CONSUMPTION AND BLOOD FLOW.

(E.) Bowen, J. C.; Pawlik, W.; Fang, W.; Jacobson, E. D. (Univ. Tex. Medical Sch. at Houston, Houston, Tex.). *Surgery* 78(4):515-519, 1975.

Side branches of the terminal trunks of the superior mesenteric artery were cannulated in 32 fasted mongrel dogs to study the effects on the mesenteric circulation of cholecystokinin-octapeptide (CCK), pentagastrin (PG), acetylcholine (Ach), glucagon, and synthetic secretin. Infusion of normal saline (0.2 ml/min) into the cannulated branch for 30 min served as a control; then CCK (0.1 μg/kg/min), PG (0.5 μg/kg/min), secretin (0.03 and 0.3 μg/kg/min), glucagon (0.5 μg/kg/min) or Ach (0.5 μg/kg/min) was infused at the same rate for 10 min. Blood flow increased 45% and O_2 consumption 23% within two min after CCK infusion began, and remained elevated throughout the 10-min period. Atropine (0.5 mg i.v.) reversed this effect. With infusion of PG, blood flow increased 60% in two min, but fell to 20% by eight min; there was a similar effect on O_2 consumption (35% at 2 min; 20% at 8 min). These effects were blocked by atropine. Ach increased flow by 55% and O_2 consumption by 35%, with both effects being reversed by atropine. Upon infusion of glucagon, blood flow increased 80% and O_2 consumption 40%, and these were unchanged by atropine. This suggests that CCK, glucagon, and PG (to a lesser extent) are mesenteric vasodilators and that the effects of CCK and PG appear to be mediated through cholinergic receptors.

8385 GLUCOCORTICOID AND MINERALOCORTICOID RECEPTORS IN GUT MUCOSA.

(E.) Pressley, L.; Funder, J. W. (Monash Univ. Dept. Medicine, Prince Henry's Hosp., Melbourne, 3004, Australia). *Endocrinology* 97(3):588-596, 1975.

A basic receptor profile for glucocorticoids and mineralocorticoids along the mucosa of the gastrointestinal tract was established using adrenalectomized and oophorectomized adult female Agouti rats. Mucosal cells from the esophagus, antral stomach, duodenum, jejunum, ileum and colon were incubated for 15 to 240 min, at 4 or 25 C, in the presence of [^{3}H]aldosterone (2×10^{-9}M) or [^{3}H]dexamethasone (2.5×10^{-8} M), after which binding of the steroids in the cells was determined. At 4 C, the specific binding of [^{3}H]-dexamethasone was maximal at 60 min, falling to half maximal level by 180 min. At 25 C, maximal binding occurred at 15 min and began to fall after 45 min. Binding of the steroid was to sites with specificity characteristics appropriate for glucocorticoid receptors. The equilibrium dissociation constant, K_{diss} (defined as the concentration at which half the binding sites are occupied), was 1.2 to 2.5 x 10^{-8} M. In the five gut tissues analyzed, dexamethasone appeared to occupy a single class of binding sites; the affinity of the receptors for dexamethasone varied from 1.0 x 10^{-8} for the ileum to 9 x 10^{-9} for the stomach and duodenum. The concentration of glucocorticoid receptors per unit of cytoplasmic protein decreased in the following order: duodenum > jejunum > ileum = stomach >colon. Their affinity for steroid hormones decreased in the following order: dexamethasone > corticosterone > deoxycorticosterone = aldosterone. No specific binding could be demonstrated in the esophageal mucosal cells. A demonstrable portion of the cytoplasmic binding of $[^3H]$aldosterone was to specific mineralocorticoid receptors. Binding sites for this steroid were demonstrated in the duodenum, jejunum, ileum and colon, but none were demonstrated in the antral mucosa. The demonstration of specific mineralocorticoid and glucocorticoid receptors in the gut mucosa serves as baseline data for any consideration of the physiology, pathophysiology or therapeutic use of adrenocorticoids in the gastrointestinal tract.

8386 SCANNING AND TRANSMISSION ELECTRON MICROSCOPY (SEM AND TEM) OF CULTURED ADULT RAT HEPATOCYTES [abstract]. *(E.)* Goldfarb, S.; Barber, T. A.; Pariza, M. W.; Becker, J. E.; Potter, V. R. (Univ. Wisconsin Med. Sch., Madison, Wis.). *Gastroenterology* 68(4):1076, 1975.

8387 USE OF NEUTRAL RED TO MEASURE GASTRIC MUCOSAL BLOOD FLOW [abstract]. *(E.)* Aures, D.; Guth, P. H.; Grossman, M. I. (VA Wadsworth Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):1057, 1975.

8388 THE EFFECT OF TRANSIT OF THE KIDNEY ON EXOGENOUS CCK [abstract]. *(E.)* Ramus, N. I.; Fender, H. R.; Rayford, P. L. (Univ. Texas Med. Branch, Galveston, Texas). *Gastroenterology* 68(4):970, 1975.

8389 GASTRODUODENAL BLOOD FLOW IN STRESS AND HYPOXIA: AN EXPERIMENTAL APPROACH [abstract]. *(E.)* Broadie, T. A.; Delaney, J. P. (Univ. Minnesota Health Sci. Cent., Minneapolis, Minn.). *Gastroenterology* 68(4):868, 1975.

8390 EFFECTS OF GASTROINTESTINAL HORMONES UPON INTESTINAL BLOOD FLOW AND OXYGEN CONSUMPTION [abstract]. *(E.)* Bowen, J. C.; Pawlik, W.; Fang, W. F.; Jacobson, E. D. (Univ. Texas Med. Sch., Houston, Texas). *Gastroenterology* 68(4):868, 1975.

8391 RELATIVE IMMUNOLOGIC AND BIOLOGIC POTENCIES OF SYNTHETIC ANALOGS AND FRAGMENTS OF CCK-OCTAPEPTIDE (CCK-OP) [abstract]. *(E.)* Go, V. L. W.; Reilly, W. M.; Ondetti, M. A.; Gardner, J. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 68(4):902, 1975.

8392 UNMYELINATED RECTAL AFFERENTS IN THE CAT VENTRAL ROOT [abstract]. *(E.)* Clifton, G. L.; Vance, W. H.; Coggeshall, R. E.; Willis, W. D. (Univ. Texas Med. Branch, Galveston, Texas). *Gastroenterology* 68(4):1088, 1975.

8393 IDENTIFICATION AND CHARACTERIZATION OF HUMAN ISOAMYLASES [abstract]. *(E.)* Gourgoutis, G. D. (Va Cent., Dayton, Ohio). *Gastroenterology* 68(4):903, 1975.

8394 THE EFFECT OF GASTROINTESTINAL HORMONES ON THE GASTRIC MICROCIRCULATION [abstract]. *(E.)* Guth, P. H.; Smith, E. (Wadsworth VA Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):907, 1975.

8395 DESTRUCTION OF LIPOPOLYSACCHARIDE COATED TARGET CELLS [abstract]. *(E.)* Kagnoff, M. F.; Campbell, S. M. (Univ. California, San Diego, La Jolla, Calif. 92037). *Gastroenterology* 68(4):920, 1975.

8396 CARRIER PRIMING OF T CELLS IN PEYER'S PATCHES BY ANTIGEN FEEDING [abstract]. *(E.)* Kagnoff, M. F. (Univ. California, San Diego, La Jolla, Calif. 92037). *Gastroenterology* 68(4):921, 1975.

8397 THE IMMUNOLOGICAL RESPONSE TO INTRAGASTRICALLY ADMINISTERED ALBUMIN AND VITAMIN A. EFFECT OF SPLENECTOMY [abstract]. *(E.)* Falchuk, K. R.; Perrotto, J. L. (Massachusetts Gen. Hosp., Boston, Mass.). *Gastroenterology* 68(4):891, 1975.

8398 THE USE OF PROSTAGLANDIN E_1 TO REVERSE EXPERIMENTALLY-INDUCED NONOCCLUSIVE INTESTINAL ISCHEMIA [abstract]. *(E.)* Davis, L. J.; Anderson, J. H.; Wallace, S.; Jacobson, E. D. (Univ. Texas System Cancer Cent. and Medical Sch., Houston, Texas). *Gastroenterology* 68(4):880, 1975.

8399 THE SYSTEMIC IMMUNE RESPONSE TO INTRAGASTRICALLY ADMINISTERED ALBUMIN: EFFECT OF VITAMIN A [abstract]. *(E.)* Falchuk, K. R.; Perotto, J. L.; Walker, W. A. (Massachusetts Gen. Hosp., Boston, Mass.). *Clin. Res.* 23(3):249A, 1975.

8400 EFFECT OF DIETARY LACTOSE AND CALCIUM ON BODY COMPOSITION IN THE GROWING RAT [abstract]. *(E.)* Romasz, R. S.; Evans, J. L. (Cook Coll., Rutgers Univ., New Brunswick, N. J.). *Fed. Proc.* 34(3):936, 1975.

8401 ORGAN SPECIFIC INTESTINAL ANTIGEN [abstract]. *(E.)* Rabin, B. S. (Univ. Pittsburgh, Pittsburgh, Pa.). *Fed. Proc.* 34(3):1018, 1975.

8402 RABBIT MODEL OF GELATINOUS DISEASE OF THE PERITONEUM ORIGINATING IN THE APPENDIX: STUDY OF GLYCOPROTEIN FRACTIONS IN THE EFFUSION. *(Fr.)* Ekindjian, O. G.; Levasseur, J. C.; Delavierre, J. P.; Jardillier, J. C.; Roux, M.; Agneray, J. (Laboratoire Biochimie, C.N.R.S., rue J.-B.-Clement, F 92290 Chatenay-Malabry, France). *Biol. Gastroenterol.* 8(2):99-106, 1975.

8403 VARIABILITY OF THE CELIAC TRUNK AND ITS ANASTOMOSES WITH THE SUPERIOR MESENTERIC ARTERY. *(Ger.)* Feigl, W.; Firbas, W.; Sinzinger, H.; Wicke, L. (Pathologisch-Anatomosches Institut, Universitat Wien, Spitalgasse, A.-1090 Wien, Austria). *Acta Anat.* 92(2):272-284, 1975.

8404 INTRAHEPATIC LYMPHOID TISSUE GRAFT: COURSE OF THE REACTION INDUCED BY PEYER'S PATCHES. *(E.)* Eloy, R.; Vaultier, J. P.; Vuitton, D.; Pousse, A.; Grenier, J. G. (INSERM, Chirurgic Expimentale Physiopathologic Digestive, Strasbourg, France). *Biomedicine* 23(4):139-143, 1975.

8405 THE GASTROINTESTINAL CIRCULATION. *(E.)* Grayson, J. (Univ. Toronto, Toronto, Canada). *Gastrointestinal Physiology,* Vol. 4, edited by E. D. Jacobson and L. L. Shanbour. Baltimore, Md., Univ. Park Press, 1974, pp. 105-138.

8406 STUDIES ON HEXOSAMINE-CONTAINING MACROMOLECULES IN THE WALL OF THE GASTROINTESTINAL TRACT OF THE RAT WITH ADDITIONAL OBSERVATIONS ON SOME PATHOLOGICAL SPECIMENS OF THE HUMAN STOMACH AND COLON. *(E.)* Terho, T. (Dept. Physiology, Univ. Turku, Turku, Finland). *Ann. Acad. Sci. Fenn. Ser. A2* 175:1-85, 1974.

8407 CHANGES IN THE COMPOSITION OF FREE AMINO ACIDS IN THE SERUM AND TISSUES IN EXPERIMENTAL INTESTINAL INFECTIONS WITH COLI BACTERIA. *(Rus.)* Niiazov, E. A.; Aripdzhanova, K. A. (Uzbek Research Inst. Pediatrics, USSR). *Med. Zh. Uzbek.* (10):66-69, 1974.

8408 BIOSYNTHESIS OF ESSENTIAL AMINO ACIDS IN MICROORGANISMS OF THE RUMEN. *(It.)* Viviani, R.; Scardovi, V.; Matteuzzi, D.; Frignani, M. (Facolta Agragria, Bologna, Italy). *Atti Accad. Sci. Inst. Bologna, Cl. Sci. Fis., Mem.* 262(5):1-25, 1974.

8409 COMPOSITION OF THE MICROFLORA IN THE DEVELOPMENT OF GASTROINTESTINAL SYNDROME IN IRRADIATED RATS. *(Fr.)* Desmettre, P. (Dept. de Protection, CEN de Fontenay-aux-Roses, France). *Bull. Inf. Sci. Tech., Commis. Energ. At. (Fr.)* (203):45-49, 1975.

8410 FOURTH SYMPOSIUM ON ORAL SENSATION AND PERCEPTION: DEVELOPMENT IN THE FETUS AND INFANT. *(E.)* Edited by J. F. Bosma. (Natl. Inst. Dental Res., N.I.H., Bethesda, Md.). Bethesda, Md., DHEW, 1973, 419 pp.

See also, 8018, 8359.

DIAGNOSTIC PROCEDURES

8411 THE ASSOCIATION OF CARCINOEMBRYONIC ANTIGEN AND PERIPHERAL LYMPHOCYTES.

(E.) Papatestas, A. E.; Kim, U.; Genkins, G.; Kornfeld, P.; Horowitz, S. H.; Aufses, A. H., Jr. (Mount Sinai Hosp., 100th St. and Fifth Ave., New York, N. Y. 10029). *Surgery* 78(3):343-348, 1975.

The possible association between carcinoembryonic antigen (CEA), peripheral lymphocyte counts, and other cancer risk factors was studied in 97 patients with myasthenia gravis and 51 control patients with granulomatous disease of the bowel, ulcerative colitis, or colonic neoplasms. The available CEA assay results from 249 patients with myasthenia gravis were also evaluated in relation to the presence of thymomas, severity of the disease, and time interval following thymectomy, and peripheral lymphocyte counts were made in an additional 107 patients with granulomatous disease of the bowel. Among the myasthenia gravis patients in whom simultaneous determinations of CEA and peripheral lymphocytes were made, CEA was positive in 17% of those with lymphocyte counts above 2,000/mm^3 and in 43% of those with lower counts. The corresponding percentages in the control group were 20% and 61%. The difference in the percentage of positive CEA assays in relation to lymphocyte counts was highly significant in both groups. A significant difference between the mean lymphocyte values in groups with different CEA titers was also found. Study of 249 additional myasthenia gravis patients showed high CEA titers and low lymphocyte counts in those with thymomas and severe myasthenia gravis and decreased CEA titers with a corresponding increase in lymphocytes following thymectomy. A progressive decrease in the mean peripheral lymphocyte counts in relation to the duration of the disease was observed in 107 patients with granulomatous disease of the bowel. The data suggest that the CEA titer may be elevated in patients with low lymphocyte counts and both determinations may be used to determine the diagnosis and prognosis in patients with known neoplasms and in high cancer risk groups.

8412 THE BUTTERFAT ABSORPTION TEST IN ADULTS.

(E.) Chaun, H.; Mullinger, M. A.; Solvonuk, P.; Ediss, I.; Bogoch, A. (Dept. Medicine, Univ. British Columbia, Vancouver, British Columbia V5Z 1K1, Canada). *Am. J. Dig. Dis.* 20(10):914-922, 1975.

The usefulness of the butterfat absorption test in assessing fat absorption was studied in adult patients with Crohn's disease (20), diarrhea (15), idiopathic ulcerative colitis (10), gluten-induced enteropathy (13), postgastrectomy and postvagotomy diarrhea (9), pancreatic disease (4), and miscellaneous gastrointestinal disorders (18). Following a six-day fat balance study, each patient was fasted (for a minimum of 8 hr) than given a 34% cream test meal (1 g butterfat/kg body weight). Venous blood samples were obtained at three and four hr after ingestion of this meal; determinations were made of serum turbidity and serum lipid electrophoresis. The lipid electrophoretic determinations were correlated with the optical density findings. Peroral jejunal mucosal biopsy specimens were also obtained for 65 patients. Of the 42 patients shown to have steatorrhea by the fat balance studies, 33 had abnormally low serum optical density values following butterfat ingestion. In eight of the 42 patients, steatorrhea could not be clearly explained on the basis of their underlying disease; 82.4% of the remaining patients with steatorrhea had an abnormal response following butterfat ingestion. The maximum rise in serum optical density following butterfat absorption was lowest in the patients with gluten-induced enteropathy and in those with Crohn's disease. The data indicate that a maximum increase in serum optical density of 0.25 or less is suggestive of steatorrhea in adult patients.

8413 LOW LACTASE LEVELS: EVALUATION OF THE RADIOLOGIC DIAGNOSIS.

(E.) Morrison, W. J.; Christopher, N. L.; Bayless, T. M.; Dana, E. A. (Johns Hopkins Medical Institutions, Baltimore, Md. 21205). *Radiology* 111(3):513-518, 1974.

A study was conducted to determine the accuracy and specificity of the lactose-barium examination of the small bowel in the diagnosis of lactase deficiency in 36 subjects. Twenty-three of these had low-lactase levels, and 13 had normal lactase levels. The subjects with normal lactase level had a normal radiologic small bowel examination when 25 g of lactose was given with a barium sulfate suspension. Of 39 evaluations of the 13 normal subjects (by three observers), there was only one reading of a hydrophilic effect for an overall false-positive rate of 2.5%. The 23 low-lactase subjects, however, usually had an abnormal radiographic pattern. Of 69 evaluations, 88% showed a hydrophilic effect and were read as lactase-deficient (overall false-negative rate of 12%). Separate evaluations of a one-hr abdominal radiograph following administration of the lactose-barium meal showed a higher false-positive rate (10%) among lactase-normal subjects and an essentially unchanged false-negative rate (10%) among lactase-deficient individuals. Radiographic factors of most value in correctly assessing roentgenograms were rapid transit to the cecum and dilution of the contrast medium in the jejunum and ileum. About 20% of the low-lactase subjects exhibited evidence of small bowel hydrophilic effect upon evaluation of complete small bowel series and one-hr abdominal radiograph obtained with the barium meal without added lactose. Among the lactase-normal subjects, 7.5% of the examinations were read as positive on both the complete small bowel series and one-hr abdominal radiograph. Eighty percent of the low-lactase subjects had flat blood sugar level curves and 100% had flat curves or symptoms following an oral lactose tolerance test. Of the subjects with normal lactase levels, 8% had flat blood sugar curves and none had symptoms. The reliability of the lactose tolerance test when the blood sugar is used as the sole method of diagnosis is compromised by factors such as the rate of gastric emptying and diabetes. The one-hr lactose-barium examination is comparable to the lactose tolerance test and offers convenience and ease of performance with less discomfort to the patient. False-positives, occurring in patients with the irritable bowel syndrome, and a 5 to 15%

false-negative interpretation in low-lactase subjects both lessen the usefulness of a single one-hr roentgenogram as a screening procedure. However, this method is still comparable to the accuracy of blood sugar determinations in the lactose tolerance test.

8414 SERUM LIPASE ACTIVITY IN CHRONIC RENAL FAILURE.

(E.) Sommer, H.; Kasper, H.; Fosel, T. (Medizinische Universitatsklinik, 87 Wurzburg, Josef-Schneider-Str. 2, Germany). *Acta Hepatogastroenterol. (Stuttg.)* 22(4):248-252, 1975.

The serum lipase activity of 110 patients (51 male, 59 female) with chronic renal failure and a glomerular filtration rate (GFR) of less than 80 ml/min was measured. The extent to which the frequency of hyperlipasemia and the degree of increased serum lipase activity corresponded to the cause and proportion of reduced renal function (and to hemodialysis therapy) was investigated. Chronic renal failure was also produced and studied in 15 male Wistar rats by 5/6-nephrectomy. Nine sham-operated rats served as controls. In 51 of 110 patients, lipase activity exceeded 200 IU (the upper limit of the normal value). The frequency of hyperlipasemia depended on the degree of reduction of renal function, the elevation of serum lipase activity and increased blood urea-N-concentration. In patients with a GRF less than 20 ml/min, the rate of hyperlipasemia was significantly higher in patients with chronic glomerulonephritis (75%) than among those with chronic pyelonephritis (46.8%). The frequency and degree of hyperlipasemia was not influenced by sex, age, or hemodialysis therapy. Significantly higher serum lipase activities were observed in nephrectomized rats (107.6 ± 72.7 IU) than in controls (41.8 ± 29.0 IU). These findings indicate that the degree of hyperlipasemia is influenced by the extent of chronic renal failure.

8415 PRELIMINARY APPRAISAL OF PRESENT ^{99m}Tc-PERTECHNETATE TECHNIQUES FOR DETECTING ECTOPIC GASTRIC MUCOSA.

(E.) Marsden, D. S.; Priebe, C. J., Jr. (Roosevelt Hosp., 428 W. 59th St., New York, N. Y. 10019). *Radiology* 113(2):459-460, 1975.

In an effort to enhance the detectability of ectopic gastric mucosa using ^{99m}Tc, a model of a Meckel's diverticulum or intestinal duplication was developed in the dog. The effects of perchlorate and Histalog (betazole) on the detection of ectopic gastric mucosa were studied. Ectopic gastric mucosa was constructed by surgically implanting a full-thickness patch of stomach wall into a Roux-en-Y ileostomy while retaining its original blood supply. Serial scintiphotographs were taken over a period of 180 min after ^{99m}Tc (1-10 mCi, i.v.) administration. Each study was repeated five times over a period of 12 months. Perchlorate (3 mg/kg) was given p.o. before the i.v. administration of ^{99m}Tc (14 mg/kg). In all cases, the ability of the stomach mucosa and the ectopic gastric mucosa to concentrate ^{99m}Tc was reduced, as compared to occasions when perchlorate was not administered. Perchlorate administration also increased the background radiation level of ^{99m}Tc in both the general circulation and in the bladder. Betazole (2 mg/kg, i.m.) did not enhance the ability of ectopic gastric mucosa to concentrate ^{99m}Tc in two dogs.

8416 COMPLICATIONS OF FIBEROPTIC ENDOSCOPY. I. ESOPHAGOSCOPY AND GASTROSCOPY.

(E.) Meyers, M. A.; Ghahremani, G. G. (New York Hosp.-Cornell Univ. Medical Center, 525 E. 68th St., New York, N. Y. 10021). *Radiology* 115(2):293-300, 1975.

Flexible fiberoptic endoscopes are being used increasingly for direct visualization and biopsy of lesions in the upper gastrointestinal tract. Contrary to earlier expectations, the incidence of complications has not decreased despite the technical advantages of modern flexible instruments over semirigid endoscopes. The semiflexible lens-gastroscope has a perforation rate of 0.05 to 6% and an overall mortality of 0.004 to 0.014%, while fibergastroscopy carries a perforation rate of 0.074% and an overall mortality of 0.019%. Two patients with perforations of the cervical esophagus following fibergastroscopy are described. In the first patient, perforation of the cervical esophagus at the level of C8 was associated with loculation of a prominent abscess cavity extending below the level of the aortic arch into the retroesophageal mediastinal tissues. In the second patient, perforation of the cervical esophagus was accompanied by localized perforation and hematoma of the midthoracic esophagus. A third patient is presented in whom fiberesophagoscopy resulted in perforation of an ulcerated carcinoma in the midthoracic esophagus into the right pleural cavity, with pneumothorax and pleural effusion. This patient died following a complicated postoperative course. The first two patients responded to drainage with or without chest intubation. When cervical esophageal perforation occurs, lateral radiographs of the neck show evidence of air in the prevertebral space in virtually all cases. Esophagography with water-soluble contrast media may demonstrate the site of perforation in only 50%; this method is more valuable in perforations of the thoracic esophagus, showing extravasation at the site in 75 to 86%. Other possible complications of fiberoptic endoscopy cited in the literature are impaction of the fiberscope, gastric perforation, pseudo-acute abdomen, submandibular swelling, and aspiration pneumonia.

8417 COMPLICATIONS OF FIBEROPTIC ENDOSCOPY. II. COLONOSCOPY.

(E.) Meyers, M. A.; Ghahremani, G. G. (New York Hosp.-Cornell Univ. Medical Center, 525 E. 68th St., New York, N. Y. 10021). *Radiology* 115(2):301-307, 1975.

Case reports are presented for eight patients who developed serious complications after undergoing fiberoptic endoscopy for endoscopic visualization and/or electrocautery removal of colonic polyps (6), evaluation of a submucosal lesion of the transverse colon (1), and evaluation of a filling defect in the hepatic flexure (1). Rectal perforation occurred in two patients, sigmoid perforation in four, perforation of the transverse colon in one, and perforation of the hepatic flexure in one. Intraperitoneal rupture was immediately apparent in three cases but was initially overlooked in a 54-yr-old man with a free perforation resulting from coagulation necrosis of the colonic wall, and in a 68-yr-old man with perforation of the transverse colon into both the peritoneal cavity and the extraperitoneal tissues. Extraperitoneal perforation in the latter patient and in two other cases was masked for several hours or days. The majority of perforations developing in diagnostic colonoscopy occurred during mechanical manipulations, including slide-by, alpha maneuver, and straightening of the sigmoid loop. The demonstration of extraluminal gas documents perforation. Rectal perforation is indicated by gas ascending the posterior pararenal spaces bilaterally, with lucent areas paralleling the lateral borders of the psoas muscles. Extraperitoneal (posterior) perforation of the sigmoid, descending, or ascending colon results in a unilateral collection of gas within the anterior pararenal space, shown by a collection of mottled lucent areas with a generally vertical axis. Perforation of the sigmoid colon at a site between the leaves of the mesocolon may give rise to extraperitoneal gas, bilaterally, within the anterior paraspaces. Radiological localization of the precise site is important in locating a clinically uncertain site of perforation, indicating the proper treatment, and anticipating possible complications.

8418 INCREASED TRYPSIN CONCENTRATION IN THE DUODENAL JUICE FOLLOWING A TEST MEAL (LUNDH TEST) AND ITS POSSIBLE DIAGNOSTIC VALUE.

(Ger.) Gyr, K.; Aenishanslin, H. W.; Kayasseh, L.; Stalder, G. A.; Agrawal, N. M.; Font, R. G. (Medizinische Universitatsklinik, Kantonsspital, CH-4004 Basel, Switzerland). *Dtsch. Med. Wochenschr.* 100 (26):1419-1422, 1975.

The Lundh test was used to study exocrine pancreatic function in 376 patients: 35 with chronic pancreatitis, 39 with acute pancreatitis, 247 suspected of having pancreatic disease, and 55 controls. The mean trypsin activity in the duodenal juice was above the upper normal limit in eight of these 376 patients, ranging from 29 to 37.1 IU/ml. Of these eight patients, two had manifest acute pancreatitis and the other six had undiagnosed epigastric and abdominal pain. In retrospect, clinical, laboratory, and radiological followups of these six patients suggest that five probably had pancreatic disease. The following retrospective diagnoses were established: acute pancreatitis (3 cases), pancreatitis and pancreatic pseudocyst (1 case), probably pancreatic disease in a patient who had peripancreatic calcifications at surgery, and functional symptoms (1 case). The percentage of patients with increased trypsin activity in the duodenal juice was significantly higher among patients with acute pancreatitis than among the control group. No correlation was found between the volume of duodenal juice and its mean trypsin activity. These findings and others reported in the literature suggest that increased trypsin activities in the duodenal juice in the Lundh test may be caused by subacute pancreatic disease and, in some cases, may be the only abnormal finding.

8419 USE OF SECRETIN IN HYPOTONIC DUODENOGRAPHY.

(E.) Gutierrez, J. G.; Chey, W. Y.; Shah, A.; Holzwasser, G. (Isaac Gordon Cent. Gastroenterol., Rochester, N.Y.) *Radiology* 113(3):563-566, 1974.

The value of secretin (1 U/kg dissolved in 0.9% sodium chloride solution, i.v.) in the radiological study of the duodenal loop was studied in 8 healthy volunteers. Six subjects were fasted and a two-lumen tube assembly was passed orally with the proximal and distal openings in the second and third portions of the duodenum, resp. The motor activity of the duodenum was recorded before and for 30 min after a bolus injection of secretin. In a second study, 8 fasted volunteers were given secretin or the vehicle alone in a double-blind fashion. The duodenum was intubated with a Rehfuss tube and 1 oz of barium was delivered prior to drug injection; 2-3 min later, 2 oz of barium were delivered into the duodenum. One hr later, the procedure was repeated using the second drug (secretin or vehicle). Motility and tonicity were evaluated and side-effects were noted. The manometric studies showed complete inhibition of motor activity in the duodenum beginning 1-4 min after secretin administration and lasting 8-14 min. In half the subjects, there was a brief period of increased motor activity prior to the onset of duodenal paralysis; this activity occurred immediately after secretin administration and lasted 1.5 to 3.5 min. In the subjects in whom this increased activity was not noted, inhibition of motor activity occurred 1-2 min earlier. In the radiologic studies, there was no significant change in motility or tonicity after saline treatment, but both parameters were significantly decreased by secretin. Secretin produced hypotonic duodenograms of excellent quality in 6 cases, good quality in 1 case, and fair quality in 1 case. A mild headache was noted in one subject in the saline group and vague abdominal distress in one subject in the secretin group. It is concluded that secretin can be effectively used for hypotonic duodenography without producing undesirable side effects.

8420 A NEW TECHNIQUE OF ENDOSCOPIC ESOPHAGEAL BIOPSY USING MULTIPURPOSE BIOPSY TUBE IN THE DIAGNOSIS OF REFLUX ESOPHAGITIS.

(E.) Mangla, J. C.; Kalra, T. M. (Monroe Community Hosp., 435 E. Henrietta Rd., Rochester, N. Y. 14603). *Am. J. Dig. Dis.* 20(8):775-780, 1975.

A new method of obtaining direct vision endoscopic, esophageal biopsies through a multipurpose biopsy tube in order to diagnose reflux esophagitis is described. After an overnight fast, the patient is given adequate sedation and analgesia and the GIF D_2 (Olympus Instruments) gastroscope is passed to the distal esophagus. With the patient in the left lateral position, the Rubins multipurpose biopsy tube is passed and, under direct vision, is placed at the biopsy site. Alternatively, the biopsy tube is passed first to a distance of 40 to 42 cm distal to the incisor teeth, the gastroscope is passed next and the biopsy tube is then withdrawn to the biopsy site. After inspection of the esophagus the biopsy tube is placed at the biopsy site and suction is applied, collapsing the esophagus around the biopsy tube so that tissue can be obtained. After observing the area for 2 to 3 min for complications, both tubes are withdrawn. This method is advantageous in that it allows direct visualization of the abnormal area to be biopsied as opposed to performing a blind biopsy. The author also suggests that direct vision will decrease complications by eliminating blind sampling of fragile areas, and will also decrease the need for multiple biopsies.

8421 ENDOSCOPIC CHEMODIAGNOSIS: IMPROVEMENT IN THE RECOGNITION OF UPPER GASTROINTESTINAL DISORDERS. *(E.)* Simko, V.; Bertrand, G. (Upstate Medical Center, Syracuse, N.Y.). *Gastrointest. Endosc.* 22(1):14-17, 1975.

To rapidly assess intraluminal pH during gastrointestinal endoscopy, 115 unselected patients were consecutively examined using Congo-red indicator (CRI) and phenol-red indicator (PRI) applied to the mucosa under direct visualization. Most patients were premedicated with diazepam, meperidine hydrochloride, and a topical lidocaine spray on the pharyngeal mucosa; food and antacids were discontinued for at least ten hr before examination. CRI demonstrated an esophageal pH of less than 3.5 in only nine of the 115 patients, seven of whom had endoscopic evidence of esophagitis. Forty of the 115 patients had a gastric pH higher than 3.5; all patients with duodenal ulcer or bleeding esophagitis, half of those with either pyloroplasty with vagotomy or gastrojejunostomy, and one of five patients with gastroduodenostomy had a gastric pH of less than 3.5. Bleeding hemorrhagic gastritis and gastric ulcer tended to be associated with a gastric pH greater than 3.5. Acid secretory studies in 37 patients confirmed the diagnostic value of CRI. The topical application of betazole to the gastric mucosa during endoscopy had inconsistent results. The results of the endoscopic acid perfusion test of the esophagus were closely related to the presence of acid in the esophagus before the perfusion test. Acid reflux into the esophagus after filling the stomach with diluted HCL was observed in six patients, all of whom had endoscopic evidence of esophagitis; the three patients with no reflux from the stomach had no evidence of esophagitis. PRI established the diagnosis of alkaline esophageal reflux as the cause of esophagitis in two patients, neither of whom had evidence of acid in the esophagus or stomach when tested with CRI. *In vitro* studies with CRI and PRI showed that the indicators were reliable even at high dilution of the indicator with gastrointestinal secretions. It is concluded that endoscopic chemodiagnosis increases the diagnostic accuracy of upper gastrointestinal endoscopy while adding only minimally to the length and cost of the procedure.

8422 THE EFFECT OF PREMEDICATION WITH CERULEIN ON RADIOLOGICAL RESULTS IN INTRAVENOUS CHOLANGIOGRAPHY. *(It.)* Colagrande, C.; Parrella, R. E.; Cecconi, L. (Universita Cattolica S. Cuore, Istituto Radiologia, Rome, Italy). *Minerva Gastroenterol.* 20(3):97-106, 1974.

Intravenous cholangiography was performed on five male volunteers, aged 19-68 yr (mean age 49 yr). Conventional cholangiography was performed by injecting fasting subjects with 20 ml of a 50% solution of mixed sodium and methylglucamine salts of Ioglycamide over a three to five min period. Exposures were made after 20, 40, 60, 90, and 120 min. After five to ten days, the examination was repeated, but cerulein (0.1 μg/kg, diluted in 20 ml of physiological saline) was injected over a three to five min period 15 min before injection of contrast medium. The extent and intensity of urinary tract opacification, which was evident in four cases during conventional i.v. cholangiography, was reduced or eliminated by cerulein. In one case, cerulein improved opacification of the extrahepatic bile ducts and in another, the common bile duct was visualized only after injection of cerulein. In two other subjects, cerulein reduced the caliber of the common bile duct but had no effect on its opacification. Cerulein increased opacification of the gallbladder in all five cases. One subject showed definite evidence of a radiolucent gallstone only after the cerulein injection. Contrast medium was found in the duodenum in only two cases; the significance of this finding is unknown. Studies of changes in the area of the gallbladder revealed that gallbladder filling was decreased by cerulein in all three subjects 20 min after injection of the contrast medium but was increased by cerulein in two subjects 120 min after injection of the contrast medium. In a fourth subject, no appreciable change occurred in gallbladder filling; this subject was subsequently found to have extrahepatic cholestasis which was confirmed by a fat meal. In the fifth subject, cerulein decreased gallbladder filling and the area of the gallbladder decreased with time after injection of contrast medium. These findings indicate that cerulein premedication improves the results of i.v. cholangiography.

8423 COMPLICATIONS ASSOCIATED WITH ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY. *(E.)* Nebel, O. T.; Silvis, S. E.; Rogers, G.; Sugawa, C.; Mandelstam, P. (Naval Regional Medical Center, Box 323, San Diego, Calif. 92134). *Gastrointest. Endosc.* 22(1):34-36, 1975.

The complications associated with 3884 endoscopic retrograde cholangiopancreatography (ERCP) procedures were evaluated by the A/S/G/E research committee. The data were obtained by questionnaire from 404 members of the A/S/G/E. The overall complication rate in this series was 21.6/1000 cases. Complications included: pancreatitis (51 cases), cholangitis (25 cases), cardiopulmonary complications (4 cases), perforation (3 cases), bleeding (2 cases), medication reaction (7 cases), and submucosal injection (1 case). Analysis of the 51 cases of pancreatitis revealed no significant precipitating factors, although this complication was reported more frequently in patients with recurrent pancreatitis. In all but two instances, the pancreatitis was mild and easily treated. There were no reports of cholangitis occurring in a radiologically normal biliary tree, and all 25 patients who developed cholangitis had common bile duct obstruction. The complications of perforation, bleeding, cardiopulmonary abnormalities, and drug reaction were similar to those seen in other endoscopic procedures. Five fatal complications were reported after ERCP: two patients with carcinoma of the pancreas developed pancreatic sepsis, one died of myocardial infarction and the other died as a result of the sepsis; two patients with carcinoma of the common bile duct developed cholangitis and died post-operatively; and cardiac arrest occurred during ERCP in a patient with atherosclerotic cardiovascular disease complicated by congestive heart failure. Because of the high frequency of sepsis, ductal obstruction demostrated by ERCP should be relieved by prompt surgical intervention. ERCP has proven to be a valuable new procedure in the clinical evaluation of a variety of pancreatic and biliary tract diseases. However, it may be associated with significant complications which must be carefully monitored and vigorously treated.

8424 INFUSION TOMOGRAPHY OF THE GALLBLADDER.

(E.) Escobar-Prieto, A.; Barrera, A.; Cabrera, V. L.; Cohen, J.; Leal, P. (Hospital Clinica del Parque, Chihuahua, Mexico). *Surg. Gynecol. Obstet.* 141(3):340-346, 1975.

The accuracy of the radiologic technique of infusion tomography in the diagnosis of biliary tract disease in 45 adult patients with suspected pathology is reported. The patients were divided into the following four groups: those with acute symtoms who had infusion tomography as the inital diagnostic study; those with obstructive jaundice in whom previous existing studies could provide no reliable information and who were also having infusion tomography as the initial study; those with chronic relapsing symptoms and a non-visualized gallbladder on p. o. or i.v. cholangiograms; and those with proven calculi by p.o. and i.v. studies. Three normal patients served as controls. Prior to infusion, upper right quadrant tomograms were taken at two cm intervals. Then 2 ml/kg of standard water soluble, low sodium, iodized contrast (50-65%) was diluted in an equal amount of 5% dextrose and the mixture was given i.v. over a 15 min period. Immediately after infusion, repeat tomograms were taken at identical levels as before. In reviewing the films, a clearly opacified gallbladder wall with a thickness of more than 1 mm was abnormal (43 patients). At surgery on 37 of the 43, 33 patients had chronic and acute lithiasic cholecystitis; one had acute cholecystitis secondary to acute pancreatitis, two had chronic lithiasic cholecystitis; and one had a normal gallbladder. Of the two patients with normal gallbladders by tomography, one was found to have intrahepatic cholestasis and the other had acute lithiasic cholecystitis. Infusion tomography seems to be more specific in diagnosing gallbladder disease in comparison to conventional readiographic means. It is a quick study and may have applications in emergency situations.

8425 THREE NEW TECHNIQUES FOR EXAMINING THE LIVER: HEPATIC ANGIOTOMOGRAPHY, HEPATOGRAPHY WITH LIPID-SOLUBLE CONTRAST MEDIUM, AND UMBILICOPORTAL SCINTIGRAPHY.

(Fr.) Elghozi, L. (No affiliation given). *J. Chir. (Paris)* 108(4):369-380, 1974.

Three techniques to increase accuracy and validity in the diagnosis of liver ailments were investigated. Hepatic angiotomography has a double purpose: (1) study of the segmentary artery space, and (2) liver exploration for pathological anomalies. The angiotomography itself consists of sections every five mm (face and profile). Lipid-soluble hepatography investigates hepatic tissue in a precise and exact way. A total of nine planes (five face, four profile) were defined in relation to extra-hepatic constants. The information provided concerned: (1) the morphology of the liver and its intrahepatic elements, (2) the lobular or segmentary topography and (3) adjacent extrahepatic structures. The validity of this second method was tested experimentally and spaces greater than two mm in diameter could be detected. Umbilicoportal scintigraphy consisted of the injection of marked microspheres in the catherized umbilical vein. In this way, the different lobes of the liver were treated equally and there was no splenic retention of the microspheres. Its major importance is in measuring the venous shunt in cases of portal hypertension. Contraindications are persistence of the Arrantius canal, portal hemangioma or sinusoidal dilatation of the liver.

8426 LABELED METRONIDAZOLES AS POTENTIAL NEW AGENTS FOR AMEBIC HEPATIC ABSCESS IMAGING.

(E.) Tubis, M.; Krishnamurthy, G. T.; Endow, J. S.; Stein, R. A.; Suwanik, R.; Blahd, W. H. (Veterans Admin. Wadsworth Hosp. Center, Los Angeles, Calif.). *Nucl. Med. (Stuttg.)* 14(2):163-171, 1975.

The development of a radiopharmaceutical capable of differentiating hepatic amebic abscesses from other space-occupying lesions of the liver by gamma-ray scintigraphy was investigated. The agents developed were ^{131}I-labeled bromometronidazole and a ^{99m}Tc-penicillamine-metronidazole complex. Toxicity studies for ^{131}I-bromometronidazole were conducted in mice. The animals were injected i.v. with 1800 times the weight of the comparable human dose at the rate of 2 mg/70 kg for man; they showed no ill effects. Rats injected with 2300 to 2600 times the comparable human dose showed no acute or chronic toxic symptoms. Neither were chronic toxicity symptoms noted in rats receiving 4000 times the human dose. Mice injected i.v. with ^{99m}Tc-penicillamine-metronidazole at 1 mg/20 g mouse, which represents 350 times the human dose, showed no toxic effects. Tests in rabbits and dogs likewise showed no evidence of toxicity. Organ distribution was studied using ^{131}I-brometronidazole in tissues and body fluids of mice and rats after the administration of the drug with or without loading doses of metronidazole. A rapid removal from the blood and clearance by way of the kidneys and liver were noted. In mice, loading with metronidazole resulted in retention in the liver, but with less excretion into the gallbladder, and showed that the liver cleared the drug at an almost constant rate. Human studies were conducted using a male patient with a space-occupying lesion which was indicated by a

Tc sulfur colloid ^{99m}Tc scintiphoto. An hepatic amebic abscess was suspected. He was scintiphotographed after i.v. administration of 300 μCi of ^{131}I-bromometronidazole and showed no uptake of the agent in the cold area. Surgery revealed a lymphoma. It is concluded that such compounds aid in distinguishing hepatic amebic abscesses from other space-occupying hepatic lesions and are therefore of aid in diagnostic work. It is not recommended that the compounds be used routinely, but rather that they may establish a diagnosis in doubtful cases.

8427 ULTRASONICALLY GUIDED PERCUTANEOUS ASPIRATION BIOPSY OF THE PANCREAS. *(E.)* Smith, E. H.; Bartrum, R. J., Jr.; Chang, Y. C. (Harvard Medical Sch., Boston, Mass.). *Radiology* 112(3):737-738, 1974.

A combined percutaneous biopsy and ultrasound technique resulted in a diagnosis of pancreatic lesions in a 75-yr-old woman who presented with a three-month history of left-sided pain and occasional nausea and vomiting. Ultrasound biopsy transducer examination and 23-gauge needle aspiration biopsy revealed a mass in the pancreatic tail. The procedure took five min and required only local skin anesthesia. The patient was symptom-free following the biopsy, which provided adequate preparations with good cellular preservation. Final cytologic diagnosis indicated malignancy and suggested pleomorphic carcinoma, giant cell type. Three hr after biopsy, laparoscopy revealed liver metastases; chemotherapy without surgery was suggested. Thus, in many cases of suspected pancreatic cancer, a percutaneous biopsy can provide a quick, definitive diagnosis with minimal risk and discomfort.

8428 THE CORRELATION BETWEEN BIOASSAY AND RADIOIMMUNOASSAY OF SERUM CHOLECYSTOKININ [abstract]. *(E.)* Johnson, A. G.; Marshall, C. E.; Dowsett, L.; Harvey, R. F. (Charing Cross Hosp. Med. Sch., England). *Gut* 16(5):398-399, 1975.

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8430 COMPARISON OF ENDOSCOPY AND UPPER GI SERIES IN DIAGNOSTIC ACCURACY AND THERAPY IN ACUTE UPPER GASTROINTESTINAL HEMMORHAGE [abstract]. *(E.)* Keller, R. T.; Logan, Jr., G. M. (Cleveland VA Hosp., Cleveland, Ohio). *Gastroenterology* 68(4):1034, 1975.

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See also, 8124, 8264, 8493, 8511, 8544, 8574, 8576, 8541, 8645, 8742, 8755, 8758, 8768, 8781, 8829, 8836, 8850, 8866, 8867, 8869, 8870, 8874, 8902, 8906, 8945, 8946, 8948, 8949, 8952, 8953, 8954, 9000, 9007, 9015, 9032, 9033, 9034, 9035, 9039, 9041, 9187, 9192, 9202, 9220, 9221, 9224, 9225, 9226, 9227, 9228, 9229, 9230, 9245, 9268, 9277, 9302, 9303, 9314, 9321, 9351, 9395, 9406, 9412, 9414.

GASTROINTESTINAL DISEASES

ESOPHAGUS

8478 CARCINOMA OF THE ESOPHAGUS. *(E.)* Rambo, V. B.; O'Brien, P. H.; Miller, M. C., III; Stroud, M. R.; Parker, E. F. (Medical Univ. South Carolina, 80 Barre St., Charleston, S. C. 29401). *J. Surg. Oncol.* 7(5):355-365, 1975.

Life tables were computed from South Carolina Tumor Registry data on 486 patients with proven squamous cell carcinoma of the esophagus, and the various factors involved in survival rate differences are described. Survival rates were plotted by age and sex; females had a slightly better survival rate than males (13% *vs* 8%). Blacks accounted for 73.4% of the cases, but survival rates were equal (11%) for both whites and blacks. Fifteen percent were private patients, indicating that socioeconomic factors may relate to incidence; however, there were no differences in survival rates based on socioeconomic factors. Localized lesions carried a better prognosis than advanced lesions (25% survival *vs* 5%) and localized lesions were 22.6% of the total. Thirty-three percent of the white group and 20% of the black group presented with localized lesions. In age comparisons, those 70 yr or older had the worst prognosis, whereas those 49 yr and younger had the best prognosis. Resectability rates were 32% of the total. The group with the most favorable prognosis was that receiving preoperative irradiation (36% five-yr survival rate). It is suggested that a randomized prospective study would be appropriate to conclude the best means of therapeutic management.

8479 TUMOR LOCALIZATION AND TREATMENT TECHNIQUE FOR CANCER OF THE ESOPHAGUS. *(E.)* Smoron, G. L.; O'Brien, C. A.; Sullivan, C. A. (Northwestern Memorial Hosp., Superior St. and Fairbanks Ct., Wesley Pavilion, Chicago, Ill. 60611). *Radiology* 111(3):735-736, 1974.

A new combination radiation therapy regimen is described for treatment of cancer of the middle and lower thirds of the esophagus, which limits the amount of spinal cord and lung exposure and thus, the subsequent morbidity. Treatment is begun using opposed mediastinal ports which include the entire esophagus. If supraclavicular or abdominal nodes are involved these are also included in the fields. The dose at tumor depth is 4000-4500 rads at 180 rads/day. When this is completed, 360 degree rotational therapy is planned and an additional 2000 to 2500 rads is given. The patient receives this rotational course in the prone position, which moves the esophagus anteriorly by 1.5 to 2.0 cm. The portal used is 6.0 cm wide at the isocenter. This treatment accomplishes two objectives: first, the dose to the spinal cord is kept within acceptable limits (i.e., the 20% isodose curve); and second, a high dose is not delivered to significant amounts of normal lung.

8480 RADIAL DISTRIBUTION OF ESOPHAGEAL PERISTALTIC PRESSURE IN NORMAL SUBJECTS AND PATIENTS WITH ESOPHAGEAL DIVERTICULUM. *(E.)* Dodds, W. J.; Stef, J. J.; Hogan, W. J.; Hoke, S. E.; Stewart, E. T.; Arndorfer, R. C. (Medical Coll. Wisconsin, Milwaukee, Wisc.). *Gastroenterology* 69(3):584-590, 1975.

The radial profile of peristaltic pressure waves in the esophageal body of five normal subjects and in six patients (3 men and 3 women, aged 30-70 yr) with esophageal diverticulum was determined. A manometric assembly featuring four radial side hole recording orifices oriented at equidistant 90 degree angles was used. Each recording catheter was infused with water at a rate of 6.1 ml/min which provided high fidelity pressure recording. The radially recorded peristaltic pressure complexes in normal subjects were similar in peak amplitude and wave form. The range of pressure differences among the four radial recordings averaged 9.0 mm Hg with a range of less than or equal to 25 mm Hg occurring in 99% of the observations. No consistent spatial orientation was noted in these variations in pressure amplitude. Of the six patients with esophageal diverticulum, the range of radial peristaltic pressure differences in five exceeded 25 mm Hg in the region of the diverticulum. The lowest pressure occurred at the recording orifice facing the diverticulum mouth. Abnormal wave forms featuring abrupt onsets or offsets were noted in occasional peristaltic sequences. It is suggested that these unusual wave forms are caused by oral-aboral diverticulum movement relative to the recording sensor during peristalsis. Abnormally high peristaltic pressure amplitudes (greater than 250 mm Hg) noted in two patients suggest that hypertensive peristaltic contractions may contribute to diverticulum production in some patients.

8481 ESOPHAGEAL INTRAMURAL PSEUDODIVERTICULOSIS. *(E.)* Beauchamp, J. M.; Nice, C. M.; Belanger, M. A.; Neitzschman, H. R. (Charity Hosp., 1532 Tulane Ave., New Orleans, La. 70140). *Radiology* 113(2):273-276, 1974.

The clinical and radiologic findings in three cases of "esophageal intramural pseudodiverticulosis" are described and some of the etiologic possibilities are discussed. The first case is that of an 83-yr-old Negro male with a history of weight loss and weakness. Physical and laboratory examinations showed him to be cachexic with an iron deficiency anemia. Esophagograms showed multiple small, narrow-necked outpouchings in the esophagus. Dysphagia developed after three yr and was progressive. Repeat esophagograms duplicated the initial findings; in addition there were findings compatible with a distal neoplasm. The second case was that of a 52-yr-old female with intermittent dysphagia of 25 yr duration and the third case was that of a 52-yr-old Negro female with gradually increasing dysphagia. Both of these cases had radiograms similar to that of the first case. The common findings in all three cases were: dysphagia (over a variable period) and evidence of esophageal narrowing, as well as numerous, small outpouchings of the esophagus. The following histologic defects are suggested as being etiologic for the pseudodiverticuli: a) hyperplasia of the mucosa with protrusion through the muscularis similar to the Rokitansky-Aschoff sinuses in the gallbladder; b) dilatation of the esophageal mucous glands; and c) protrusion of pulsion diverticuli through existing neurovascular gaps. Elevated luminal pressure is also suggested as a cause. The association of *Candida albicans* with the diverticuli in two of the three cases is thought to be due to superinfection.

8482 ESOPHAGEAL INTRAMURAL PSEUDODIVERTICULOSIS. *(E.)* Boyd, R. M.; Bogaoch, A.; Greig, J. H.; Trites, A. E. W. (Shaughnessy Hosp., Vancouver, British Columbia, Canada). *Radiology* 113 (2):267-270, 1974.

The radiologic, endoscopic and autopsy findings in a 50-yr-old patient with intramural esophageal pseudodiverticulosis is reported. The patient presented with dysphagia of two yr duration. Esophagoscopy showed distal esophageal narrowing and many small, yellowish mucosal elevations throughout the esophagus. Review of 14 esophageal roentgen studies showed distal spasm and a large number of protrusions from the wall of the cervical esophagus to the carina. The small outpouchings had narrow necks projecting three mm from the lumen; larger outpouchings were also seen (flat-based and flask-shaped, with 4 mm orifices). Biopsy specimens showed deep crypts extending through the muscularis mucosa, and revealed chronic inflammation as well. At autopsy, the gross specimen showed nodular elevations over most of the mucosa. The esophageal mucous glands and ducts were microscopically shown to be widely dilated and a few of these had progressed to microabscesses. Inflammatory cells and necrotic debris were also seen in addition to cyst-like areas. The findings in eight other patients described in the literature were also reviewed. It was noted that the common finding in all of these cases was of numerous, flask shaped barium-positive projections, 2 to 3 mm in size. It is suggested that the initial esophagitis, followed by inflammation (which compresses excretory ducts in the esophagus), initiates the process. Abnormal motor activity due to esophagitis may subsequently cause strictures which in turn raise intraluminal pressure. It is suggested that this may be the pathophysiological mechanism of esophageal intramural diverticulosis.

8483 ROENTGEN FEATURES OF DYSPHAGIA AORTICA. *(E.)* Birnholz, J. C.; Ferrucci, J. T.; Wyman, S. M. (Harvard Medical Sch., Boston, Mass.). *Radiology* 111(1):93-96, 1974.

The radiographic appearance of involved thoracic structures is described in 30 patients with dysphagia aortica who were symptomatic for their disease. Four patients had descending aortic aneurysms, one had kinking of the proximal descending aorta with ectasia of the arch and ascending aorta, and the remainder had varying degrees of ectasia and tortuosity of the distal thoracic aorta; all had dysphagia and extrinsic compression of the distal esophagus. On roentgenograms of the chest, all patients had mild to moderate aortic dilatation. Twelve had left ventricular enlargement. Upright and supine esophagograms were performed. Fourteen patients demonstrated tertiary contractions of the esophagus. Partial to subtotal obstruction of the distal esophagus was a constant feature and persistent fluid levels and retained food were also noted in some cases. The inferior border of the barium column was smooth, sharply defined and exactly parallel to the course of the right lateral aspect of the aorta. Pulsatile displacement of the inferior barium margin was observed fluoroscopically. These characteristic findings should lend themselves to forming an approach to the diagnosis of this disorder.

8484 ELECTROMAGNETIC BOUGIENAGE TO LENGTHEN ESOPHAGEAL SEGMENTS IN CONGENITAL ESOPHAGEAL ATRESIA. *(E.)* Hendren, W. H.; Hale, J. R. (Massachusetts General Hosp., Boston, Mass.). *New Engl. J. Med.* 293(9):428-432, 1975.

In two infants with esophageal atresia, electromagnetic force was applied to metallic bougies in an effort to elongate the segments of the esophagus so as to permit their anastomosis at a later time without the risk of undue tension. The use of electromagnetic bougienage in these two cases avoided colon esophageal replacement. Bougienage lasted for 58 days in the first case, but was shortened to 30 days in the second. If use of this technique is anticipated, the gastrostomy site should be near the midline so that the lower pouch device will point straight upward in the mediastinum. It is suggested that this technique of intermittent, magnetically induced bougienage may be useful in treating infants with rectal atresia with a high pouch after a diverting colostomy is performed. Magnetism is not known to have any adverse effect on the patient. It is felt that this technique may be applicable for 10-20% of infants with esophageal atresia who are not suited for primary anastomosis. However, it is suggested that it is particularly advisable to monitor the electrocardiograms and electroencephalograms of patients exposed to magnetic fields for prolonged periods.

8485 EXPERIMENTAL GASTROESOPHAGEAL REFLUX IN THE AUSTRALIAN BRUSH-TAILED POSSUM. (E.) De Carle, D. J. (Prince Henry Hosp., Syndney, New South Wales, Australia). *Gastroenterology* 69(3): 625-629, 1975.

The effect of surgical division of the lower esophageal sphincter (LES) in the Australian brush-tailed possum was studied manometrically, radiographically, and endoscopically. The effect of LES abolition by itself was determined. Adult animals were sedated with diazepam, 0.4 mg/kg, i.m., and LES activity was assessed. The animals were then sedated more deeply with ketamine hydrochloride, 10 mg/kg, i.m., and esophagitis was assessed visually. Gastroesophageal reflux was assessed radiographically. Within one wk of the initial assessment, five animals underwent cardioplasty and five others underwent sham operations. All animals were studied at two-wk intervals postoperatively until death or until 24 wk. Before operation, no animal had evidence of either gastroesophageal reflux or esophagitis. In the ten animals LES pressure was 12.6 mm of Hg. The sphincter was 0.5 to 1.0 cm long and the distance from the incisor teeth was 19.5 cm. In the sham-operated group there was no significant change in LES pressure from preoperative levels when the animals were restudied at 2, 4, and 6 wk postoperatively. There was no evidence of gastroesophageal reflux or esophagitis at any stage. In animals which had undergone cardioplasty, the zone of high pressure was no longer detectable at two wk and the animals had free gastroesophageal reflux. There was only mild esophagitis. At four to six wk, all had free reflux, still without a demonstrable zone of high pressure, and all had developed moderate esophagitis. This persisted for 10 to 12 weeks, when (4 animals) sphincter pressure reappeared and the gastroesophageal reflux was no longer detected. In these animals (by 16 and 20 weeks) esophagitis was no longer detected. In the fifth animal gastroesophageal reflux and severe esophagitis were still present at eight months. At six months a stricture of the lower esophagus was apparent. The model of gastroesophageal reflux used in this study is superior to previous models as the esophagus of the animal used closely resembles that of man. Further, the operation produced little anatomical derangement while it did produce a gross physiological change. This study provides direct evidence that absence of LES activity alone is sufficient to produce gastroesophageal reflux and esophagitis. It is suggested that the LES in man is also important in preventing gastroesophageal reflux.

8486 SURGICAL CORRECTION OF REFLUX. AN EFFECTIVE THERAPY FOR ESOPHAGEAL STRICTURES.

(E.) Larrain, A.; Csendes, A.; Pope, C. E., II. (Hosp. J. J. Aguirre, Santiago, Chile). *Gastroenterology* 69(3):578-583, 1975.

The effect of an adequate antireflux operation (posterior gastropexy with cardia calibration) on the subsequent course of benign strictures of the esophagus was studied. The operation was performed on 24 patients (20 men and four women, aged 35-85 yr). Prior to surgery, pyrosis was experienced by 15 patients, pain by 15, regurgitation by 15, and dysphagia by 24. Respiratory symptoms were present in seven patients. Following surgery no patient experienced pyrosis, pain, or respiratory symptoms, only one experienced regurgitation and only three still had dysphagia. Prior to surgery, the diameter of the strictures measured less than 10 mm in 19 of the 24 patients, and remained so after operation in only one case. Radiological reflux, demonstrated in 19 patients before surgery, was found in only four after surgery. Sphincter pressure of less than 5 mm was recorded in 10 of 18 patients before and in none of 19 patients after surgery. Abnormal esophagoscopy was noted in 21 of 23 patients before and in no patient after operation. One 62-yr-old male was judged to have unsatisfactory surgical results, but refused reoperation. The only other patient who did not have satisfactory results, a 69-yr-old man, underwent reoperation during which the gastropexy was taken down, a cardiac calibration was added, and the gastropexy was reattached. This effort led to a satisfactory result with disappearance of dysphagia, an increase in the stricture diameter, and a decrease in the prestenotic dilation of the rest of the esophagus. From the results of this study in its concluded that posterior gastropexy with cardiac calibration has been shown to treat well-established, high grade strictures quite effectively without the need to resort to postoperative dilations. Since this operation does not have the higher mortality and morbidity of more formidable procedures such as interposition, it is suggested that this should be the procedure of choice in peptic strictures of the esophagus.

8487 SURGICAL TECHNIQUE FOR MANAGEMENT OF REFLUX ESOPHAGITIS AFTER ESOPHAGOGASTRECTOMY FOR MALIGNANCY--FURTHER APPLICATION OF ROUX-EN-Y PRINCIPLE.

(E.) Smith, J.; Payne, W. S. (Mayo Graduate Sch. Medicine [Univ. Minnesota], Rochester, Minn.). *Mayo Clin. Proc.* 50(10):588-590, 1975.

The application of long limb Roux-en-Y drainage procedure in a patient with bile esophagitis following extensive proximal gastric resection with the retention of the antrum is described. The patient was a 50-yr-old woman who underwent esophagogastrectomy for a gastric adenocarcinoma. Continuity was restored by an end-to-end esophagogastrostomy with pyloroplasty. Although she was free of recurrent malignancy, the patient developed severe esophagitis with bile reflux and also became anorectic, nauseous, and exhibited weight loss. Through an upper midline incision, the patient's abdomen was entered and re-explored. The duodenum was transected distal to the pyloroplasty and the distal duodenal stump was closed. The right gastric and gastroepiploic vessels were preserved as the blood supply to the gastric remnant. An 18 inch Roux-en-Y anastomosis was then developed and joined end-to-end to the proximal part of the duodenum. Biliary and other secretions were thus diverted into the uppermost, closed end of the duodenum. The patient recovered and was asymptomatic thereafter. It is concluded that the long limb of the Roux-en-Y provides an effective peristaltic barrier to reflux of bile and other secretions from the small bowel into the stomach and esophagus.

8488 LONG-TERM RESULTS ON FUNCTION OF ESOPHAGOPLASTIES MADE FROM THE RIGHT HALF OF THE COLON.

(Rus.) Zhupan, V. F. (S. M. Kirov Military Medical Acad., Leningrad, USSR). *Klin. Khir.* (2): 42-45, 1975.

Using the right half of the colon, esophagoplasties were performed on 47 patients with cicatricial stenosis of the esophagus and on 26 patients with esophageal cancer. Part of the ileum was included in 36 cases. Most patients with esophageal stenosis were between 20 and 40 yr old, while most of those with cancer were aged 40 to 70 yr. There were two surgical deaths: an eight-yr-old boy who died of shock and a cancer patient who died of cachexia. Long-term followups were performed in 58 cases: for three yr in 33 cases and for longer periods in 25. Barium passed through the artificial esophagus in one to five min in 42 patients and in 6-30 min in 16 with deep haustrations in the transplant. Transit was particularly slow in cases in which the transplant included more than 10 cm of the terminal ileum. Even in patients with gastroesophageal reflux who had antiperistaltic transplants, contrast medium never rose above the ileocecal valve when this valve was included in the transplant. In eight patients, an isoperistaltic segment of intestine (right colon alone in 2 patients, right colon with ileocecal valve in 6) was anastomosed directly to the glottis. No complications resulting from antiperistaltic activity of the transplant developed in any of these patients. For six yr after surgery, one patient with an antiperistaltic transplant suffered from regurgitation of the gastric contents into the mouth and respiratory tract. The gastric motility and stomach emptying time were decreased in all patients examined. In some patients, the stomach took as long as 24 hr to empty. Gastric atonia and pylorospasm are attributed to section of the vagus nerve when the esophagus was removed. Long-term followups on 57 of 71 patients with transplants of the right colon showed that 16 of the 19 cancer patients died of metastases and recurrences within one or two yr; only two patients survived five yr. Of the 38 patients with esophageal stenosis, eight survived from 13 to 18 yr, 16 from 9 to 12 yr, and 9 from 7 to 8 yr; the rest survived for shorter periods. The author drew no conclusions.

8489 ACHALASIA OF THE ESOPHAGUS: A REAPPRAISAL OF ESOPHAGOMYOTOMY VS FORCEFUL PNEUMATIC DILATION.

(E.) Arvanitakis, C. (Univ. Wisconsin Sch. Med., Madison). *Am. J. Dig. Dis.* 20(9):841-846, 1975.

Fifty-six patients with achalasia of the esophagus who were treated over a 14-yr period by forceful pneumatic dilation (33 patients) or esophagomyotomy (23 patients) were followed for periods of 1-11 yr. The effectiveness of the 2 methods of treatment was evaluated by clinical, radiographic, and endoscopic criteria. Satisfactory results were achieved in 67% of the patients treated by pneumatic dilation, but the remaining 33% failed to show any subjective or objective improvement. Esophagomyotomy achieved satisfactory results in 3 of the patients in whom dilation was unsuccessful. Failure of forceful dilation commonly occurred in patients with long-standing, advanced achalasia. Resolution of dysphagia and improvement in the radiographic appearance of the esophagus occurred in the immediate postoperative period in 91% of the patients treated with esophagomyotomy. Dysphagia did not recur in any of the patients, nor were there any early or late postoperative complications. In the two patients in whom esophagomyotomy was unsuccessful, failure was attributed to advanced achalasia rather than to the surgical technique. Thus, esophagomyotomy is a more effective form of therapy than forceful pneumatic dilation in the treatment of achalasia. Esophagomyotomy carries a low morbidity and mortality rate and is an appropriate choice in the advanced stage of disease and in cases in which pneumatic dilation fails to produce significant clinical improvement.

8490 EVALUATION OF THE EFFECT OF FUNDOPLICATION ON THE INCOMPETENT LOWER ESOPHAGEAL SPHINCTER.

(E.) Higgs, R. H.; Castell, D. O.; Farrell, R. L. (U.S. Naval Hosp., Phila., Pa.). *Surg. Gynecol. Obstet.* 141(4):571-575, 1975.

The effect of Belsy Mark IV fundoplasty on the competency of the lower esophageal sphincter was studied in seven adults with chronic gastroesophageal reflux as the only alimentary tract abnormality. All patients had sphincter pressures of less than 10 mm of Hg prior to surgery and ten persons without disease and with pressures greater than 10 mm of Hg were used as controls. Manometric readings of the gastroesophageal high pressure zone before and after surgery were obtained with a standard polyvinyl catheter arrangement. Intraluminal pressures were monitored continuously and mean pressures were calculated at one min intervals. Mean preoperative pressure was 5.8 mm of Hg and postoperatively was 15.6 mm of Hg with a control value of 16.2 mm of Hg. Mean percent relaxation of the gastroesophageal high pressure zone in response to ten dry swallows was also obtained before and after surgery. Preoperatively, patients had a 93.1% relaxation *vs* 86.4% postoperatively. The response to 80 µg/kg of edrophonium (i.v.) was also studied. The maximum pressure change in response to the drug, preoperatively, was an increase of 5.1 mm of Hg, and 10.0 mm of Hg postoperatively, *vs* a control level of 22.6 mm of Hg (a significant increase postoperatively). The response to a protein meal (100 g of lean beef) was also studied for 75 min after initiation of the meal; however, no significant differences between pre- and postoperative levels were noted. It is concluded that normotensive basal gastroesophageal high pressure readings are obtained after fundoplasty. This increase is attributed to improved function of the lower esophageal sphincter smooth muscle.

8491 THE CLINICAL SIGNIFICANCE OF CERVICAL ESOPHAGEAL AND HYPOPHARYNGEAL WEBS.

(E.) Nosher, J. L.; Campbell, W. L.; Seaman, W. B. (Columbia-Presbyterian Medical Center, New York, N.Y.). *Radiology* 117(1):45-48, 1975.

An investigation was made of the incidence of cervical esophageal webs in a group of 55 patients (17 men and 38 women, aged 18-79 yr). Associated symptomatology and diseases in a large series of examinations were also evaluated so that the clinical significance of the webs might be ascertained. A total of 1,000 consecutive 16-mm cineradiographies of the hypopharynx and cervical esophagus (taken at 9 frames/sec) were reviewed. One or more cervical esophageal or hypopharyngeal webs were diagnosed, an incidence of 5.5% in patients referred for upper gastrointestinal examination. Nine patients had multiple webs. There was no correlation with sex of the patient. Patients older than 50 yr had more webs than those under 50 yr. Although 11 patients complained of dysphagia, it was localized in the cervical esophagus and was thought to be attributable to the webs in only six cases. Of 48 patients for whom hematological data were available, 16 (5 men and 11 women) were anemic. While the overall incidence of iron deficiency anemia was increased in the patients with webs, the difference was not statistically significant. None of the seven patients with iron deficiency had dysphagia. The etiology of anemia in the 16 patients with webs included iron deficiency (7), acute gastrointestinal blood loss (5), multiple myeloma (2), glucose-6-phosphate-dehydrogenase deficiency (1), and chronic disease (1). Diagnoses of other diseases in patients with webs included hiatus hernia (10), peptic ulcer disease (7), hypertension (5), alcoholism (4), thyroid disorder (4), syphilis (3), diabetes mellitus (2), congestive heart failure (2), and rheumatoid arthritis (1). It is concluded that most hypopharyngeal and cervical esophageal webs have no relation to the Plummer-Vinson syndrome, iron deficiency anemia, pemphigoid, epidermolysis bullosa, or ulcerative colitis. It is suggested that these webs differ from those seen in inflammatory disorders, and (with the occasional exception of patients with dysphagia) that they are of no clinical significance.

8492 ALTERATION OF ESOPHAGEAL PERISTALSIS BY PENTAGASTRIN IN PATIENTS WITH DIFFUSE ESOPHAGEAL SPASM. *(E.)* Eckhardt, V. F.; Kruger, J.; Holtermuller, K.-H.; Ewe, K. (Depts. Medicine and Radiology, University of Mainz, Mainz, West Germany). *Scand. J. Gastroenterol.* 10(5):475-479, 1975.

The effects of exogenous pentagastrin on esophageal peristalsis were studied in nine patients with diffuse esophageal spasm (mean age, 60.3 yr), and in ten normal subjects (mean age, 54.6 yr). Manometric pressure recordings of esophageal peristalsis were obtained and respiration and swallowing was also observed. Peak amplitudes and duration of contractions (initiated by dry swallows) were recorded 20 min before and after drug injection. The effects of pentagastrin (6 μg/kg, s.c.) and Carbachol (0.125 mg/kg, i.m.) were studied. Pentagastrin was also administered as multiple, 30 sec i.v. doses from 0.02 to 0.4 μg/kg. With s.c. pentagastrin, mean peak amplitude increased to 31.2 mm of Hg in patients *vs* 12.1 mm of Hg in controls. Carbachol increased the mean peak amplitude to 25.1 mm of Hg in patients *vs* 6.3 mm of Hg in controls. The maximal duration of peristaltic contractions was increased by pentagastrin to 11.3 sec in patients *vs* 1.9 sec in controls, and by Carbachol, to 9.5 *vs* 3.3 sec. In seven patients, no changes were noted after injection of either drug. With i.v. pentagastrin, the dose-response curve showed significant differences only at the 0.4 μg/kg dose. Maximal amplitudes in response to this dose were 67.9 mm of Hg for patients and 39.1 mm of Hg for the controls, and the maximal duration of contractions increased from 12.6 sec (pre-injection) to 21.8 sec after injection. The results suggest that pentagastrin increases maximal amplitude and duration of peristalsis contractions in patients with diffuse esophageal spasm and that Carbachol, a cholinergic agent, produces a similar effect.

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8495 ETIOLOGY AND PATHOGENESIS OF ESOPHAGEAL DIVERTICULUM FISTULAS. *(Rus.)* Vantsyan, E. N.; Chissov, V. I. (Dept. Thoracic Surgery, I. M. Sechenov First Moscow Medical Inst., Moscow, USSR). *Khirurgiia* (5):103-108, 1975.

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8534 APERISTALSIS OF THE ESOPHAGUS: SYSTEMATIZATION OF SYNCHRONOUS COMBINED SURGERY BY TWO SURGICAL TEAMS. *(Por.)* Pimenta, L. G. (Cirurgiao do Hosp. Maternidade "Santa Rita," Brasil). *Folha Med.* 69(5):501-504, 1974.

8535 CHAGASIC MEGAESOPHAGUS IN CHILDREN. CLINICAL ASPECTS. *(It.)* Jorge, J.; Santana, E.; Rosa, H.; Sampaio Teixeira, A.; de Rezende, J. M. (Academica do curso medico, Universidade Federal de Goias, Brazil). *Rev. Goiana Med.* 20(3/4):171-190, 1974.

8536 ASSOCIATION OF MEGAESOPHAGUS AND CARCINOMA: THE CLINICAL FEATURES OF A CASE OF MEGAESOPHAGUS ASSOCIATED WITH CARCINOMA ARE DESCRIBED. *(It.)* Paoli, P.; Nannelli, U. (Ospedale Generale di Zona, Firenze, Italy). *Osp. Ital. Chir.* 27(2/3):79-83, 1974.

See also, 8420, 8450, 8475, 8579, 8604, 8606, 8608, 8641, 8649, 8650, 9142, 9179, 9312, 9315, 9330, 9343, 9369, 9379.

8537 THE SIALIC ACID AND CARBOHYDRATE CONTENT AND THE SYNTHESIS OF GLYCOPROTEIN FROM RADIOACTIVE PRECURSORS BY TISSUES OF THE NORMAL AND DISEASED UPPER INTESTINAL TRACT.

(Eng.) Roberts, S. H.; Heffernan, C.; Douglas, A. P. (Royal Victoria Infirmary, Newcastle upon Tyne, NE1 4LP England). *Clin. Chim. Acta* 63(2):121-128, 1975.

The incorporation of $[^{14}\text{C}]$glucose into human gastric and jejunal mucosa obtained by peroral biopsy was used to study the biosynthesis of glycoproteins in these tissues and to determine the suitability of this method for investigating abnormalities in human disease. Fresh tissue fragments were incubated in Krebs medium III containing labeled glucose, as well as unlabeled streptomycin, L-glutamate, penicillin, kanamycin, and/or rifampicin. The precipitate was homogenized, dialyzed, and analyzed by scintillation counting. The labeled sugars in the postincubation material were identified by descending paper chromatography; bacteria were also identified in the mucosal fragments after incubation and the tissue specimens were examined histologically. The gastric mucosal samples contained a larger amount of sialic acid/mg of protein and a smaller amount of total hexose/mg of protein than did the jejunal mucosal samples. The tissues from patients with and without peptic ulcers did not differ chemically, and there were no chemical differences between normal jejunal mucosa and jejunal mucosa from patients with treated and untreated celiac disease. Gastric biopsies obtained without aseptic precautions incorporated 7% or more of the radioactivity when incubated with $[^{14}\text{C}]$glucose. Much of this incorporation was abolished by the addition of antibiotics to the incubation medium. There was great variability in the amount of radioactivity incorporated by the gastric mucosal specimens, but there was no correlation between incorporation and disease or histological diagnosis. Ribose was always labeled in tissues incorporating $[^{14}\text{C}]$glucose, even in those specimens from which bacteria could not be cultured. These ribose peaks were small, however, and large peaks were found corresponding to galactose and fucose. Similar results were found with the jejunal mucosal samples. In four subjects, gastric juice samples were sterile, but in three of these patients, organisms were isolated from the biopsy specimens. The results suggest that bacteria may normally be present in the mucous layer of the stomach and that bacteria make a major contribution to the *in vitro* incorporation of radioactive glucose into glycoprotein. This method is not suitable for the study of *de novo* synthesis in either gastric or jejunal mucosa.

8538 GASTRIC OPERATIONS AND GLUCOSE HOMEOSTASIS. II. GLUCAGON AND SECRETIN.

(Eng.) Bruer, R. I.; Zuckerman, L.; Hauch, T. W.; Green, W.; O'Gara, A. M.; Lawrence, A. M.; Foa, P. P.; Matsuyama, T. (Evanstown Hosp., Evanstown, Ill. 60201). *Gastroenterology* 69(3):598-606, 1975.

The serum glucose, immunoreactive insulin (IRI), pancreatic glucagon (IRG), and glucagon-like immunoreactivity (GLI, presumably of gastrointestinal origin) levels were measured after p.o. glucose (100 g) in normal subjects and in patients who had undergone gastric surgery (antrectomy or pyloroplasty with truncal vagotomy) for duodenal ulcer at least one yr previously. In some tests, p.o. glucose administration was followed by a 26-min infusion of secretin. The mean fasting serum glucose, IRI, IRG, and GLI levels did not differ significantly among the three groups of subjects and the mean i.v. glucose k values (after 25 g glucose were injected in 2 min) were similar. Thus, the response of the pancreatic islets to direct glucose stimulation was unaltered by the surgical procedures in the duodenal ulcer patients. The early hyperglycemic response to p.o. glucose and the associated elevation of plasma GLI were much greater and the IRI levels were slightly higher in the surgical patients than in the normal subjects. A nonsignificant decrease in the IRG level was noted in all groups after p.o. glucose. In the gastrectomy patients, secretin infusion during repeated p.o. glucose tolerance tests partially corrected the hyperglycemia and lowered the plasma GLI and IRI level; secretin in these patients had no effect on the peak or cumulative IRG levels. During secretin infusion, the gastrectomy subjects noted less severe symptoms of dumping than during the standard test. Secretin had no effect on the alimentary hyperglycemia or hormonal responses in the vagotomy and pyloroplasty patients nor in the normal controls. The data indicate that intolerance to p.o. glucose after gastric surgery may be related to elevated GLI levels, and that the beneficial effect of secretin may be due to its ability to decrease these levels.

8539 CARDIAC CHANGES DURING 2-DEOXY-D-GLUCOSE TEST: A STUDY IN PATIENTS WITH SELECTIVE VAGOTOMY AND PYLOROPLASTY.

(E.) Burckhardt, D.; Stalder, G. A. (Medizinische Universitäts-Poliklinik, Hebelstrasse 1, CH-4056 Basel, Switzerland). *Digestion* 12(1):1-8, 1975.

The detailed effect of i.v. 2-deoxy-D-glucose (2-DG) on the heart was studied by investigating the questionable arrhythmogenic action of 2-DG and the influence of 2-DG on myocardial contractility. A total of 37 patients were tested at periods of 6 to 12 months following selective vagotomy and pyloroplasty. None of the 27 patients in whom a continuous ECG recording with the Holter-Avionic system was performed showed a serious arrhythmia such as ventricular tachycardia, idioventricular rhythm, nodal rhythm, atrial fibrillation or atrial flutter, either before or after administration of 2-DG. Of the patients having atrial or ventricular premature contractions in their tracings before and/or after administration of 2-DG, the total number of premature beats was not increased by 2-DG. In nine patients, the ECG remained completely unchanged throughout the recording period. The only significant ECG changes after 2-DG administration were T-wave flattening and QT prolongation. Known vagal effects such as bradycardia, lengthening of the PR interval, or A-V blocks were not seen in this study. Serious arrhythmias were not provoked by 2-DG, since none of the 27 patients so tested for rhythm disturbances showed atrial fibrillation, atrial flutter, nodal or idioventricular rhythm. No cardiodepressive action was noted. On the contrary, myocardial contractility was enhanced, as evaluated by the systolic time intervals. It is concluded that since no serious effects on the ECG, cardiac conduction, or impulse formation were noted after 2-DG administration, and considering the slight increase in myocardial contractility, 2-DG is viewed as a safe drug when given to patients with no known heart disease under the age of 60. It is urged, however, that this drug be given only under strict observation.

8540 THE EFFECTS OF ACETYLSALICYLIC ACID ON THE HUMAN GASTRIC MUCOSA AS REVEALED BY GASTROCAMERA. *(E.)* Edmar, D. (Sahlgren's Hosp., S-413 45 Göteborg, Sweden). *Scand. J. Gastroenterol.* 10(5):495-499, 1975.

The effects of a buffered solution of acetylsalicylic acid and of a conventional disintegrating tablet on the gastric mucosa were investigated using a gastrocamera. The study was performed in eight healthy volunteers (7 men and 1 woman, aged 24-33 yr) with no history of upper gastrointestinal disturbances. The study was performed as a crossover comparison between two forms of acetylsalicylic acid: a conventional tablet containing 0.5 g acetylsalicylic acid and 0.07 g heavy magnesium oxide; and an effervescent tablet containing 0.5 g acetylsalicylic acid, 0.5 g citric acid, and 1.25 g sodium bicarbonate. When dissolved in water, the former tablet had a pH of about 3; the latter had a pH of about 6. The dosage used was 1 g acetylsalicylic acid three times/day for three days. After a three-week interval, the same procedure was repeated with the other test preparation. Of the seven subjects who took tablets without buffer, all had multiple and prominent erosions following administration of the tablets. After taking the buffered solution, four were without visible erosion, three had a few localized erosions, and one had multiple and prominent erosions. Blood clots were present in the gastric juice of all seven subjects after taking unbuffered tablets. After the buffered solution, blood clots were found in three of the eight cases. The mean plasma concentration of salicylate analyzed two hr after the last dose of tablets was 127 μg/ml. The corresponding value after the buffered solution was 90 μg/ml. Pronounced side effects did not occur in any subject after medication. Three complained of a slight feeling of repletion after buffered dosages, but two of these reported the same feeling after taking the tablets. Hunger feelings after both preparations were reported in one subject, and heartburn occurred in one after taking the unbuffered preparation; heartburn did not occur in any patients after buffered acetylsalicylic acid. A slight epigastric burning sensation occurred in one on the third day after administration of the tablets. It is concluded that any person taking conventional acetylsalicylic acid tablets in the dose regimen studied runs a risk of developing lesions of the gastric mucosa. This risk is lessened when acetylsalicylic acid is taken in the form of a buffered solution.

8541 PARENTERAL ASPIRIN PRODUCES AND ENHANCES GASTRIC MUCOSAL LESIONS AND BLEEDING IN RATS. *(E.)* Meeroff, J. C.; Paulsen, G.; Guth, P. H. (VA Wadsworth Hosp. Center, Los Angeles, Calif. 90073). *Am. J. Dig. Dis.* 20(9):847-852, 1975.

The effect of parenteral sodium acetylsalicylate (Na ASA, 15 or 60 mg/kg, i.p.) on the development of gastric mucosal lesions and bleeding was studied in 20 male Sprague-Dawley rats and in 30 rats subjected to cold-restraint stress three hr after drug injection. Ten rats, injected with saline, i.p., served as controls. Rats injected with 60 mg/kg Na ASA developed significantly more lesions (mean lesion score, 8.2) than both the control animals (0.2) and the rats injected with 15 mg/kg Na ASA (2.5). Only two of the ten control animals developed lesions. Both doses of Na ASA produced a significantly greater blood loss (decrease in hematocrit value) than the control, but the two dose levels did not differ significantly. Rats subjected to cold-restraint alone developed a large number of stomach lesions; the addition of 15 mg/kg Na ASA did not significantly increase the number. However, lesion formation in the cold-restraint group was significantly increased by 60 mg/kg Na ASA. Both doses of Na ASA caused greater blood loss than saline. The results suggest that parenteral aspirin in small doses has an effect on hemostasis, while larger doses may work directly on the gastric mucosa.

8542 ANTRAL GASTRITIS. *(E.)* Turner, C. J.; Lipitz, L. R.; Pastore, R. A. (Fitzsimons Army Medical Center, Denver, Colo.). *Radiology* 113(2):305-312, 1974.

In an effort to improve diagnostic accuracy of the routine upper gastrointestinal series in patients with gastric antral disease, a review was made of 19 patients (11 men and 8 women, aged 15-61 yr) in whom the upper series had been negative but in whom endoscopy had disclosed superficial antral disease. The study revealed a clinical pattern of antral gastritis that had not been previously reported. Three radiologic patterns were found to be reliable indicators of antral disease: a flattened or narrowed antrum indicating loss of one or both of the prepyloric shoulders (particularly at the lesser curvature); antral mucosal crenulation (the antrum demonstrating a wrinkled or irregularly corrugated appearance); and abnormal peristalsis, manifested as antral spasm. Any of the above antral findings constituted radiological diagnosis of antral gastritis. At endoscopy, three abnormal patterns were also observed: patchy, erythematous inflammation of the antrum; shallow, punched-out, aphthous ulcers in the antrum; and a "spoke-wheel" erythematous reaction, which appeared as linear streaks of erythema radiating proximally from the pylorus on all walls. The previous belief that if an abnormality does not persist throughout the examination it is probably not real is doubtful. Even a transient antral deformity may represent significant superficial mucosal disease. It is concluded that antral gastritis is a distinct clinical entity; that antral gastritis can be reliably diagnosed by routine fluoroscopic examination, obviating the need for endoscopy; and that the diagnosis of antral gastritis will substantially increase the yield of positive findings at fluoroscopy.

8543 ADENOMYOSIS OF THE GASTRIC ANTRUM IN CHILDREN. *(E.)* Bush, W. H., Jr.; Hall, D. G.; Ward, B. H. (Children's Orthopedic Hosp. and Medical Center, Seattle, Wash.). *Radiology* 111(1): 719-181, 1974.

Adenomyosis of the gastric antrum occurring in three children (2 boys and 1 girl, aged 2 mo to 8.5 yr) is presented. At laparotomy in one case, a 1 cm nodule in the submucosa was excised. Pathological study showed this material to be aberrant pancreatic tissue. In the second case, laparotomy revealed an intramural mass with intact mucosa adjacent to the pylorus, which was pathologically identified as a mixed tumor of indeterminant type. In the third case, laparotomy showed a raised mass in the antrum and a fibrous tumor was removed from the submucosa. Pathology revealed adenomyosis, characterized by large bundles of smooth muscle surrounding multiple clusters of benign-appearing glands and mildly dilated ducts. It is suggested that adenomyosis of the gastric antrum is a single entity encompassing a histological spectrum from the poorly differentiated tumor or adenomyoma to the well differentiated aberrant pancreas and Brunner's gland hyperplasia. It appears as an ovoid, smooth, sharply marginated tumor in the gastric antrum. A central dimple or niche, though infrequent, defines the well differentiated lesion from the leiomyoma. It is suggested that adenomyosis of the gastric antrum occurs more frequently in the pediatric patient than has been previously recorded.

8544 THE RETAINED GASTRIC ANTRUM. *(E.)* Dunlap, J. A., Jr.; McLane, R. C.; Roper, T. J. (Greenville Memorial Hosp., Greenville, S. C. 29602). *Radiology* 117(2):371-372, 1975.

A case of retained gastric antrum in a 53-yr-old man is reported. The patient presented with severe epigastric pain, nausea, and vomiting. He had a long history of peptic ulcer disease with earlier hospitalizations for closure of perforated ulcer, subtotal gastric resection and vagotomy, revision of gastrojejunostomy, and closure of a gastrojejunocolic fistula. An upper gastrointestinal series showed a marginal ulcer, a retained gastric antrum with complete filling of the afferent loop, and well-defined gastric mucosal folds. A gamma camera image of the upper abdomen following i.v. ^{99m}Tc pertechnetate (5 ml) demonstrated activity in the gastric pouch and a second area of activity to the right of the midline, indicating functioning gastric mucosa in the retained antrum. At laparotomy a remnant of antrum was resected. The specimen showed well-preserved rugal architecture with good preservation of the gastric mucosa and muscularis. The patient did well postoperatively. Any patient with chronic, recurrent peptic ulceration following subtotal gastric resection and gastrojejunostomy should have an adequate upper gastrointestinal series with complete filling of the afferent loop. I.v. ^{99m}Tc pertechnetate is a noninvasive technique which aids in the identification of a retained gastric antrum.

8545 ENDOSCOPIC DIAGNOSIS OF "CALIBRE-PERSISTENCE", A RARE CAUSE OF MASSIVE GASTRIC HEMORRHAGE. *(E.)* Domján, L.; Biliczki, F.; Lóránd, P.; Cserényi, L.; Bordás, F. (County Hosp., Kecskemet, Hungary). *Endoscopy* 7(3):169-173, 1975.

Emergency endoscopy, performed as part of a standard hospital routine, was used to obtain correct diagnoses in three patients (one woman and two men, aged 21-83 yr) suffering from massive gastric hemorrhage. In the first patient, an 83-yr-old male who suddenly vomited a large amount of blood, endoscopy revealed a tumor-like lesion, 15-18 mm in diameter, covered with blood and mucus 5 cm distal to the cardio-esophageal junction on the anterior wall. The patient died in cardiac failure. Necropsy revealed a superficial erosion covered with a blood clot of 14 mm diameter. After removing the clot, a large vessel, 0.6 mm in diameter, was visible in the center of the erosion. Histology disclosed dilated arteries without arteriosclerotic changes lying below the mucosa, which was superficially ulcerated at the point where the artery approached the surface. Adjacent mucosa showed moderate inflammatory changes. The analysis of this case enabled more accurate diagnoses by endoscopy to be made in the following two cases. Endoscopy on one patient revealed arterial hemorrhage from the center of an erosion when the abdomen was firmly pressed. This sign, as well as the absence of tortuous arterial segment in the vicinity of the erosion which would be characteristic of gastric aneurysm, supported the possibility of caliber-persistence. In the third case, endoscopy revealed a small erosion, covered with a cap of thrombus, at 5 to 6 cm below the cardia on the posterior wall. By jetting ice water through a teflon tube, the thrombus was removed and arterial hemorrhage started from an abnormally dilated artery located in the center of the erosion. Endoscopic diagnosis was caliber-persistence. It is noted that effective management of acute upper gastrointestinal hemorrhage depends on accurate diagnosis. With the use of emergency endoscopy the cause of hemorrhage can be established in 80 to 95% of the cases. In caliber-persistence, the main pathological alteration is the presence of an oversized artery just beneath the mucosa and the erosion is only secondary. Caliber-persistence is not demonstrable by radiologic techniques. Exact diagnosis can be established only by endoscopy.

8546 RECURRENT GASTROINTESTINAL BLEEDING IN OSLER'S DISEASE SUCCESSFULLY TREATED BY ENDOSCOPIC ELECTROCOAGULATION IN THE STOMACH. *(E.)* Weingart, J.; Lux, G.; Elster, K.; Ottenjann, R. (I. Med. Abt. Stadt. Krankenhaus Munchen-Neuperlach, 8 Munchen 83, Oskar-Maria-Graf-Ring 51, Germany). *Endoscopy* 7(3):160-164, 1975.

Endoscopic electrocoagulation was used in the treatment of a 42-yr-old female patient known since age 37 to have hereditary telangiectasia. The patient had been repeatedly hospitalized for frequently recurring gastrointestinal bleeding. On esophago-gastro-duodenoscopic examination, more than 30 angiomas were found, located predominantly in the fundus and antrum of the stomach, any or all of which might have been potential sources of bleeding. An emergency gastrotomy with ligation of bleeding vessels had had no effect on the course of her disease. Neither had any success been achieved through the use of iron preparations, clotting agents and avascular membrane-active substances. During an esophago-gastroscopic examination, the button-tipped coagulation probe was used at a medium current intensity to coagulate 15 to 20 angiomas. During a second session, several more mucosal angiomas in the fundus and antrum were treated with the coagulation probe. Following this treatment, two further episodes of gastointestinal bleeding were noted within three months, both of which stopped spontaneously. In the following 21 months, no further gastrointestinal bleeding occurred and hospitalization or blood transfusions were no longer needed. At this time esophago-gastro-duodenoscopic examination was performed as part of the follow-up procedure, and the coagulation probe was used to treat 15 further angiomas in the stomach. It is suggested that the endoscopic electrocoagulation of bleeding "Osler angiomas" in the stomach should always be attempted before resorting to surgery.

8547 MENETRIER'S DISEASE: REPORT OF A CASE WITH TRANSIENT AND REVERSIBLE FINDINGS. *(E.)*

Lesser, P. B.; Falchuk, K. R.; Singer, M.; Isselbacher, K. J. (Harvard Medical Sch., Boston, Mass.). *Gastroenterology* 68(6):1598-1601, 1975.

A case of Menetrier's disease which resolved spontaneously over a three-wk period is reported. Shortly after eating a crabmeat sandwich, a 49-yr-old woman suddenly developed nausea and vomiting which lasted five days. Ten days after the onset of vomiting, she began to notice bilateral ankle edema, which extended to her groin and was accompanied by weight gain. She also noted cramping abdominal pain which was relieved by frequent feeding and pruritus of one leg without a skin rash. There were no stigmata of liver disease. An upper gastrointestinal series demonstrated enormous, irregular, nonulcerated, distorted gastric folds extending from the fundus to the antrum along the lesser and greater curvature. The small bowel appeared normal. Biopsies through an endoscope demonstrated cystic dilation of the more basally oriented glands. Excretion of i.v. [^{51}Cr]albumin in the stools was increased to 11.6% and the serum protein and albumin concentrations were reduced. The patient was placed on a low salt-high protein diet. Within three wk of the start of her illness she felt better, the leg edema had decreased markedly, and she was free of abdominal pain. The serum protein and albumin levels increased to normal values; a repeated upper gastrointestinal series two months from the onset of the disease showed a marked decrease in the size of the gastric folds, and a repeat [^{51}Cr]albumin study showed a decrease in excretion to 1.4%. The patient developed some pruritus, edema, and a rash at the chromium injection site. The patient is currently symptom-free with normal serum protein levels. This patient has the classical features of Menetrier's disease. A hypersensitivity reaction may have been involved in the pathogenesis of the gastric protein loss.

8548 HL-A3 AND HL-A7 IN PERNICIOUS ANAEMIA AND AUTOIMMUNE ATROPHIC GASTRITIS. *(E.)*

Mawhinney, H.; Lawton, J. W. M.; White, A. G.; Irvine, W. J. (Dept. Therapeutics, Univ. Edinburgh, Edinburgh EH3 9YW, Scotland). *Clin. Exp. Immunol.* 22(1):47-53, 1975.

The results of a study of 29 patients (25 women and 4 men) with pernicious anemia and 46 patients (45 men and 1 woman) with autoimmune atrophic gastritis without evidence of vitamin B12 malabsorption are presented. In pernicious anemia there was a significant increase in the frequency of HL-A7 and of the HL-A3,7 haplotype compared to controls. A smaller increase in the frequency of HL-A3 was not statistically significant. In atrophic gastritis there was a similar, but statistically insignificant, increase in the frequency of HL-A3. There was no tendency for the frequency of HL-A7 or of the HL-A3,7 haplotype to be increased in the atrophic gastritis group. There was no increase in the frequency of any other HL-A specificity in either group of patients or in the series as a whole. The incidences of gastric parietal cell antibody and intrinsic factor antibody in pernicious anemia correspond to those normally found. Due to the bias in the selection of patients for gastric analysis, the incidence of both antibodies in atrophic gastritis was considerably higher than usual. No HL-A specificity was found associated with an increased incidence of either autoantibody compared with the overall incidence in either patient group or in the series as a whole. The increased frequency of HL-A3 in the whole series of patients with pernicious anemia or uncomplicated atrophic gastritis demonstrated in this study confirms the association of HL-A3 with gastric autoimmune disease. The association of pernicious anemia, but not of autoimmune atrophic gastritis, with HL-A7 and the HL-A3,7 haplotype would suggest that the progression from autoimmune atrophic gastritis to pernicious anemia is under the influence of an HL-A-linked gene.

8549 PHYTOBEZOARS OF THE SMALL BOWEL FOLLOWING GASTRIC SURGERY. *(E.)*

Moskowitz, H. (Mount Sinai Hosp., Hartford, Conn.). *Radiology* 113(1):23-26, 1974.

Two cases of bezoars composed of partially-digested orange segments are reported and pertinent literature is reviewed. A 64-yr-old woman, 14 yr postgastrectomy with a Bilroth II anastomosis, and a 56-yr-old woman, 16 yr postgastrectomy, were admitted with signs and symptoms of small bowel obstruction. Both patients were edentulous and complained of crampy abdominal pain. Abdominal films were characteristic of mechanical obstruction with distended loops of small bowel with air-fluid levels at different heights. A mottled density with numerous lucencies was noted in the right lower quadrant of both patients. At operation, a large bezoar was removed from the distal small bowel corresponding to the density on abdominal film. Pathological analysis revealed various forms of fibrous matter including partially digested orange slices. Obstruction of the small bowel by bezoars appears to be dependent upon the physical characteristics of the bolus, the condition of the teeth and the absence of pylorus, with 90% of reported phytobezoars due to oranges. The ileum, being the narrowest part of the small bowel with the least forceful peristaltic waves and being an area of water resorption, is a likely spot for obstruction. Loss of pyloric function with consequent decrease in time spent in the stomach, decreased acid and enzyme activity, along with poor mastication are important contributory factors. Phytobezoars could be eliminated in 90% of postgastrectomy patients by improved chewing habits and avoidance of citrus fruits.

8550 THE RADIOLOGIC MANIFESTATIONS OF PSEUDOLYMPHOMA OF THE STOMACH. *(E.)* Chiles, J. T.; Platz, C. E. (Dept. Radiology, Univ. Chicago, Chicago, Ill.). *Radiology* 116(3):551-556, 1975.

The clinical records and radiographs of 14 men and four women (average age at diagnosis, 51 yr) with gastric pseudolymphoma were reviewed. Most patients had a long history of gastrointestinal complaints (mean, 11 mo) and some had noted a recent increase in severity. Gastroscopy was performed in 14 cases; the ulcerated mass was diagnosed as a benign ulcer in five of these, as a carcinoma in three, and as questionably neoplastic in six. In 4 of 5 patients in whom gastric biopsy was performed, the report was chronic gastritis or inflammation; in 9 of 10 patients, cytological examination was considered negative for malignant cells. Treatment included at least 50% gastrectomy in 15 cases, local resection in one, simple biopsy in two, and radiation therapy in seven. The initial pathologic diagnosis was pseudolymphoma or benign lymphoid hyperplasia in nine patients, and malignant or possibly malignant lymphoma in nine. Eleven patients were alive without evidence of lymphoma 4 to 22 yr after the original diagnosis; one other patient died from a pulmonary *Aspergillus* infection following radiotherapy and chemotherapy for a presumed malignant lymphoma, and another died from metastatic rectal adenocarcinoma. The radiographic findings appeared to fall into three relatively distinct groups: tumor masses (7 cases); enlarged gastric rugae (6 cases); and benign-appearing ulcers (5 cases). The initial radiographic diagnosis was carcinoma in four cases, malignant lymphoma in three, benign submucosal tumor in one, indeterminate lesion in three, and benign ulcer in five. Ulceration was described at gross examination in all 16 cases in which the entire lesion was available, and in seven cases multiple ulcers or erosions were noted. The lesion(s) was found in the antrum (6 patients) or along the lesser curvature (3 patients), often extending onto the anterior and/or posterior surfaces (6 patients). The radiographic appearance did not correlate well with the findings at gross examination. All of the cases were histologically characterized by proliferation of lymphoid tissue, usually in an irregular or nodular pattern in relation to varying amounts of fibrous tissue. Lymphocytes predominated, but scattered plasma cells and eosinophils were often present. The lymphoid proliferation was limited to the submucosa in eight cases, involved the muscularis propria in five cases, and involved the serosa in five. Vascular sclerosis or thrombosis strongly suggested chronic peptic ulcer disease in 12 cases. The findings support the suggestion that pseudolymphoma of the stomach is most often a reaction to chronic peptic ulcer disease.

8551 PRIMARY GASTRIC TUBERCULOSIS: A CASE REPORT. *(E.)* Page, R. E.; Williams, R. E.; Benson, E. A. (General Infirmary, Leeds, England). *Br. J. Surg.* 62(8):618-620, 1975.

The case report of a 34-yr-old man with primary gastric tuberculosis was presented in order to emphasize the difficulty in diagnosing this disorder. Two barium meal examinations within 10 months failed to identify gastric tuberculosis; however, the second test meal revealed a constant filling deformity in the antral region. Gastroscopy visualized a flat sloughing lesion of obscure nature in the pyloric antrum. Laparotomy revealed a firm, infiltrating lesion in association with lymph node enlargement around the coeliac axis, left gastric artery and subpyloric region. The condition was diagnosed as carcinoma of the stomach with secondaries on the terminal ileum. Partial gastrectomy and small bowel resection followed. Staining of sections with auramine phenol fluorescent technique (a funnel section of stomach, 11 x 11 cm and a tube of small intestine, 35 cm long x 5 cm diameter) revealed the presence of tubercle bacilli in the lesion. Postoperative antituberculosis chemotherapy was instituted and the patient made a satisfactory recovery.

8552 METASTATIC DISEASE INVOLVING THE STOMACH. *(E.)* Menuck, L. S.; Amberg, J. R. (Univ. Hosp., Univ. California Sch. Medicine, La Jolla, Calif.). *Am. J. Dig. Dis.* 20(10):903-913, 1975.

The incidence, primary sites, symptoms, and effects of palliation in metastatic disease of the stomach were investigated in 22 patients. Metastatic disease involving the stomach was found at autopsy in 17 patients (of 1010 autopsies of patients with cancer) and by clinical diagnosis in five patients. The primary malignancies found at autopsy were melanoma and cancers of the lung, breast, pancreas, testis, and ovary. Ten of the 17 patients did not seem to have clinically significant metastatic disease; in the other 7 cases, epigastric pain, melena, and anemia were the most common clinical manifestations. Radiographic studies of the upper gastrointestinal tract in 13 of the 17 patients revealed normal radiographic findings in three, solitary polypoid lesions in five, multiple sites of involvement of the stomach in three, and lesions of an infiltrative type in two. Gastric metastases of breast carcinoma and melanoma show distinctive radiographic patterns; an infiltrating "linitis plastica" pattern is seen in about 50% of the gastric metastases from carcinoma of the breast. Melanoma metastatic to the stomach often develops multiple, small ulcerating masses (a "bull's-eye" configuration).

Although nonspecific epigastric pain and melena were the symptoms that most commonly led to the proper diagnosis, radiographic examination of the gastrointestinal tract is essential. The radiographic findings are usually sufficient to suggest the diagnosis.

8553 ENDOCRINE-TYPE GRANULES IN CELLS OF GLOMUS TUMOR OF THE STOMACH. *(E.)* Kim, B. H.; Rosen, Y.; Suen, K. C. (State Univ. New York Downstate Medical Center, Brooklyn, N. Y.). *Arch. Pathol.* 99(10):544-547, 1975.

Electron microscopy was used to describe the ultrastructure of a glomus tumor removed from the pyloric region of a 57-yr-old woman. A moderate number of mast cells were irregularly scattered throughout the tumor. Electron microscopy revealed round or oblong tumor cells arranged in lobules or sheets around dilated blood vessels. Amorphous structures resembling basement membrane were seen surrounding individual and grouped tumor cells. The protoplasmic membranes of the cells showed many pinocytotic vesicles. The cytoplasm contained a moderate number of mitochondria with swollen cristae, dilated endoplasmic reticulum, numerous filaments with focal condensations, endocrine-type granules bound by a single membrane, rudimentary cilia, and centrioles. In most cells, pinocytotic vesicles were obvious. Filaments with focal condensations or as individual scattered fibrils were noted in many cells. In about 80% of the cells, endocrine-type granules were diffusely scattered throughout the cytoplasm; these were often in greater concentration adjacent to the Golgi complex. The majority of the granules were of uniform density and surrounded by a single membranous structure. Higher magnification showed fine granular subunits arranged in a wavy pattern. Occasional granules showed very darkly staining aggregates of these subunits. Cilia were found in only a few tumor cells. They were of rudimentary nature and were located adjacent to the centrioles. The presence of the endocrine-type granules suggests that these tumor cells possess not only contractile properties but also secretory activity.

8554 ENDOSCOPIC REMOVAL OF BENIGN GASTRODUODENAL TUMOURS. *(E.)* Moulinier, B.; Faivre, J.; Marchat, F.; Lesbros, F.; Lambert, R. (Edouard Herriot' Hosp., F-69374 Lyon, France). *Endoscopy* 7(3):121-125, 1975.

The clinical results and complications associated with the endoscopic resection of benign gastroduodenal tumors were studied in 71 men and 60 women with a total of 150 apparently benign gastroduodenal tumors. The age range was 18 to 82 yr, and 37 were followed up for periods up to 30 days. In 114 cases, a single polyp was found; the most common gastric location was the antrum (87 of 127 cases) and the most common duodenal locations were the bulb and genu superius (16 of 23 cases). Recuperation of the polyp was possible in 129 cases. In the stomach, endoscopic resection was generally carried out for adenomatous polyps; malignancy was observed in only four cases. In the duodenum, resection was generally carried out for a tumor developed from Brunner's glands; no malignancy was observed. Complications included breaking of the diathermic snare during the section in three cases, pain and epigastric distress following the procedure in five cases, fever following the procedure in three cases, incarceration of the snare necessitating surgery in one case, and severe bleeding following section in six cases. The diathermic section was followed by the development of a yellowish scar or ulceration which healed gradually within three to four wk. A piece of the stalk remained in cases in which the polyp was pediculated. The clinical data indicate that polypectomy is a safe procedure which allows an accurate histological diagnosis and determination of the best management procedure. The procedure is indicated in cases of small (less than 2 cm) adenomatous polyps in the stomach and duodenum.

8555 GASTRIC ACID SECRETION FOLLOWING RENAL TRANSPLANTATION. *(E.)* Canavan, J. S. F.; Briggs, J. D.; Bell, P. R. F. (Western Infirmary, Glasgow G11 6NT, Scotland). *Br. J. Surg.* 62(9): 737-740, 1975.

The effect of immunosuppressive therapy on gastric acid secretion after renal transplantation was studied. During a 4½-yr period, renal transplants were carried out on 71 patients (42 men and 29 women, aged 16-47 yr). After transplantation they received prednisolone in decreasing doses (200 mg on day 1, to 40 mg on day 17, with a slower reduction thereafter to 15 mg at 3 months). Prednisolone (1 g) was given i.v. at the time of transplantation and was repeated to a maximum of 6 to 8 g during rejection episodes. Azathioprine was given as a single daily dose which ranged from 25 to 200 mg. All patients received aluminium hydroxide (30 ml) every four hr for the first month after transplantation. Of these 71 patients, ten were selected at random for gastric acid studies (5 men and 5 women, aged 20-45 yr). Barium meal studies were performed in eight of these ten and revealed a duodenal ulcer in one patient. Four of the ten patients had dyspepsia before transplantation and one developed dyspepsia following his transplant. In men, the mean basal acid output was 3.8 mEq/hr before and 3.4 mEq/hr after transplantation. Both values were greater than those in normal subjects. Corresponding figures for women were 1.2 and 1.4 mEq/hr, resp., not significantly different from controls. In pretransplant studies, the mean peak acid output following pentagastrin administration (6 µg/kg, i.m.) was 37.2 mEq/hr in males and 26.3 mEq/hr in females. No significant change occurred following transplantation in peak acid output. Maximal acid concentration was slightly higher in both males (116 mEq/l) and females (104 mEq/l) on regular dialysis than in normal subjects. This did not change significantly after transplantation. In the series of 71 patients, the incidence of hemorrhage from peptic ulcer was 7%. One of these patients had a perforation. That no further increase in acid output occurs following transplantation despite a high intake of steriods suggests that steroids may not exert their ulcerogenic effect through increased acid secretion.

8556 INCIDENCE OF STRESS ULCER FORMATION ASSOCIATED WITH STEROID THERAPY IN VARIOUS SHOCK STATES. *(E.)* Jama, R. H.; Perlman, M. H.; Matsumoto, T. (Hahnemann Medical Coll. and Hosp., 230 North Broad St., Philadelphia, Pa. 19102). *Am. J. Surg.* 130(3):328-331, 1975.

A retrospective evaluation of the incidence of gastrointestinal bleeding associated with the use of pharmacologic doses of steroids in various shock states was undertaken. Patients in clinical shock resulting from sepsis, hemorrhage, or cardiac failure were included. The patients were divided into three groups, depending on the type of steroid therapy that had been given. Group I (8 women and 9 men, aged 21-82 yr) received the standard shock regimen plus Decadron (5 mg/kg) or Solu-Medrol (30 mg/kg) given as a bolus, and then repeated every four to six hr for 24 to 36 hr. Group II (6 women and 6 men, aged 17-75 yr) received the standard shock regimen plus hydrocortisone (1.4 mg/kg), Solu-Medrol (1.8 mg/kg), or Decadron (0.7 mg/kg) every four to six hr for an average duration of 96 hr. Group III (8 women and 11 men, aged 21-85 yr) received standard shock management without steroid therapy. There was a 57.9% incidence of acute gastric ulceration in group III, compared with a 33.3% incidence in group II and a 5.9% incidence in group I. Hemorrhage was not a prominent feature in group I patients. However, 25% of those in group II and 45.9% in group III experienced severe gastric bleeding. No significant difference in mortality was found between groups I and II, 82.3 and 83.3%, resp. However, a 94.7% mortality was noted among patients in group III. The results suggest that there is a considerably lower incidence of stress ulceration with the use of steroids in pharmacological doses, compared with the incidence when lesser doses of steroids are used and when no steroids are used. This population was statistically atypical in that all patients were in the shock state and experiencing the most severe form of physiologic stress. The authors suggest that the initial insult in the formation of gastric ulcers during stress may be a decrease in perfusion of the gastric mucosa (the acute gastric vasoconstriction syndrome) that results in mucosal ischemia. This ischemic mucosa is then subject to increased gastric secretions, increased gastric acidity, delayed gastric emptying, bile reflux, or one of the other factors currently considered to be related to gastric ulceration. It is suggested that the usefulness of steroids lies in their ability to reduce the amount of arteriovenous shunting when administered in pharmacological doses.

8557 PREVENTION AND TREATMENT OF STRESS EROSIONS AND STRESS ULCER WITH GEFARNATE (GERANYL FARNESYLACETATE). *(Ger.)* Markoff, N.; Infanger, K.; Cahannes, M.; Herwig, W. (Loestrasse 135, CH-7000 Chur, Switzerland). *Praxis* 63(52): 1573-1576, 1974.

A double-blind study was performed to determine whether gefarnate is of value in the prevention and treatment of stress erosions and stress ulcers in patients suffering from trauma and in those undergoing major surgery. Gefarnate was administered in 50 mg doses to 19 of 23 patients with trauma, starting when these patients were hospitalized. Stress ulcers developed in 2 of the 19 treated patients and in two of four controls who received placebos. Gefarnate was also administered to 26 of 29 patients with septic infections or who were undergoing tumor or biliary tract surgery. Treatment was begun as soon as possible before surgery and was continued for three wk postoperatively. Bleeding stress ulcers developed in 2 of the 26 treated patients and in two of the three controls. Statistical analysis of the results demonstrated that stress ulcers occurred significantly more often in controls than in patients receiving gefarnate. Five case reports are also presented to illustrate the effect of gefarnate on chronic duodenitis, gastritis, and duodenal ulcers. Treatment with gefarnate (50 mg twice a day, i.m. for 7 days) alleviated severe chronic duodenitis in a 53-yr-old woman. Symptomatic improvement occurred in a 37-yr-old man with chronic antral gastritis who received gefarnate. Recovery occurred without the use of diet or abstinence from nicotine and moderate quantities of alcohol, but a recurrence developed when gefarnate therapy was discontinued. Subjective improvement occurred in a 39-yr-old man with a chronic recurrent duodenal ulcer after p.o. administration of gefarnate for about 1.5 months. No radiological evidence of an ulcer was found on followup. A 39-yr-old woman with acute erosive gastritis became asymptomatic after two blood transfusions and i.m. administration of 50 mg of gefarnate twice a day for 12 days. Administration of gefarnate (50 mg three times a day, p.o.) to a 71-yr-old man with an 11-yr history of recurrent duodenal ulcers produced symptomatic improvement within one week, but a recurrence developed after therapy was discontinued. Therapy was resumed and, nine months later, was finally discontinued since the patient had no further recurrences.

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8618 GASTRIC CARCINOMA. *(Ger.)* Hammer, B. (Kantonsspitals, CH-9006 St. Gallen, Switzerland). *Munch. Med. Wochenschr.* 117(31):1279-1284, 1975.

8619 SEVERE AND PROLONGED PARALYSIS OF THE STOMACH AND DUODENUM FOLLOWING CHOLECYSTECTOMY. *(Fr.)* Pouyet, M.; Treboux, M.; Rea, B. (Clinique Claude-Bernard, 69600 Oullins, France). *Lyon Chir.* 71(4):254-255, 1975.

8620 THE CANCER REGISTRY OF CALI COLOMBIA--EPIDEMIOLOGIC STUDIES OF GASTRIC CANCER. *(Eng.)* Correa, P.; Bolanns, Q.; Garcia, F. T.; Gordillo, G.; Duque, E.; Cuello, C. (No affiliation given). *Rec. Results in Cancer Res.* 50:155-169, 1975.

8621 RADIOTELEMETRIC INVESTIGATIONS OF GASTRIC pH IN GASTRIC DISEASES. *(Rus.)* Khadzhikov, V. S.; Khonelidze, G. B. (Moldavian Res. Inst. Oncology, Kishinev, USSR). *Klin. Med. (Mosk.)* 53(4):65-69, 1975.

8622 ACID SECRETORY FUNCTION OF THE STOMACH IN PATIENTS GIVEN LONG-TERM PREDNISOLONE THERAPY. *(Rus.)* Minushkin, O. N. (I. M. Sechenov 1st Moscow Medical Inst., USSR). *Klin. Med. (Mosk.)* 53(4):60-64, 1975.

See also, 8109, 8189, 8406, 8415, 8442, 8445, 8450, 8452, 8472, 8487, 8490, 8494, 8500, 8502, 8503, 8512, 8518, 8533, 8625, 8627, 8628, 8631, 8633, 8637, 8641, 8644, 8649, 8658, 8712, 8717, 8719, 8721, 8903, 8999, 9013, 9205, 9269, 9279, 9315, 9318, 9328, 9330, 9343, 9359, 9369, 9385, 9406, 9414.

STOMACH

Peptic Ulcers

8623 FACTORS RELEVANT TO THE PROGNOSIS OF CHRONIC GASTRIC ULCER. *(E.)* Piper, D. W.; Greig, M.; Coupland, G. A. E.; Hobbin, E.; Shinners, J. (Dept. Medicine, Univ. Sydney, Sydney, Australia). *Gut* 16(9):714-718, 1975.

The effects of complete healing, ulcer size, initial healing rate, age, sex, smoking, and aspirin intake on the natural history of chronic gastric ulcer were studied in 105 chronic gastric ulcer patients. The patients were followed up by postal questionnaire, and those who complained of recurrent abdominal symptoms were subsequently examined radiologically. In addition, 60 patients were studied on an inpatient basis to determine the initial rate of ulcer healing. Ulcer recurrence was present in 15 of the 60 patients discharged with the ulcer healed and in 25 of the 45 patients discharged with the ulcer unhealed. The incidence of large ulcers (greater than 51 mm^2) was significantly greater in those discharged with the ulcer unhealed, but the recurrence rate was twice as great in the unhealed group compared with the healed group regardless of ulcer size. The frequency of recurrence was not correlated with the initial rate of ulcer healing, continued cigarette smoking, continued analgesic ingestion, sex, or age. Similarly, sex and age had no effect on initial ulcer size. The results indicate that complete healing of a gastric ulcer by medical treatment may reduce the subsequent morbidity due to gastric ulcer by about 1/2.

8624 THE INCIDENCE IN COPENHAGEN COUNTY OF GASTRIC AND DUODENAL ULCERS IN THE SAME PATIENTS. *(E.)* Bonnevie, O. (Gentofte Univ. Hosp., Hellerup, Denmark). *Scand. J. Gastroenterol.* 10(5):529-536, 1975.

A prospective, epidemiologic study was conducted to determine the incidence of persons with both gastric and duodenal ulcers in a geographically well-defined population comprising 1/10 of the Danish population. The study was carried out in Copenhagen County during the period January 1, 1963 to December 31, 1968; only those residents born between January and June were included. During this period, 1905 new patients with ulcer disease were identified. In 80 patients (Category I) both a duodenal and gastric ulcer were diagnosed at the first "positive" diagnostic examination, while in 47 cases (Category II) the primary and "secondary" ulcers were recognized at different examinations in the period 1963 to 1968, and in 46 cases (Category III) a primary ulcer was recognized before 1963 and a secondary ulcer was recognized during the period 1963 to 1968. Among the total 173 cases involving both gastric and duodenal ulcer, the two ulcers coincided at a given time in 121 cases. In all categories, a sex ratio of about 2.1:1 was observed, and in all categories and among both sexes the median age was 56 yr. The age distribution was similar to that for solitary gastric ulcer, but was significantly higher than that for solitary duodenal ulcer. The median period from the time of symptomatic debut to diagnosis of ulcer disease was significantly longer for Category I (3 yr) than for Categories II or III (1 yr each). In Categories II and III, the interval between diagnosis of the two ulcers was four yr or less in 50% of the cases. There was a significant increase in the number of gastric and duodenal ulcer patients between 1963 (0.98/10,000 inhabitants) and 1968 (1.24/10,000 inhabitants). The total annual incidence was 1.15/10,000 inhabitants or 1.55/10,000 at risk aged 15 yr or greater. In all age groups there was a relatively constant predominance of men and in both sexes the incidence was greatest between 30 and 60 to 69 yr. The ratio of the incidence of solitary duodenal ulcer, solitary gastric ulcer, and simultaneous duodenal and gastric ulcer was 8:2:1. The data suggest a definite relationship (possibly a common determining factor) between the two types of ulcer.

8625 OBSERVATIONS OF GASTRIC MUCOSAL BLOOD FLOW USING ^{99}Tc^{m} IN RAT AND MAN.

(E.) Taylor, T. V.; Pullan, B. R.; Elder, J. B.; Torrance, B. (Manchester Royal Infirmary, Manchester, England). *Br. J. Surg.* 62(10):788-791, 1975.

The value of ^{99m}Tc clearance as a measurement of gastric mucosal blood flow and as a discriminant of gastric function in various disease states was assessed in 15 pylorus-ligated Wistar rats and in 30 human patients (17 with duodenal ulcer, 5 with gastric ulcer, 3 with normal stomachs, 2 with gastritis, and 3 cases of hypochlorhydria). In the rat study, a bolus of [^{14}C]-aminopyrine, tritiated quinine, or ^{99m}Tc was injected i.v. and samples of venous blood and the stomach contents were obtained at 15-min intervals for one hr. The samples were analyzed by scintillation counting. In the human study, 1 mCi of ^{99m}Tc was given i.v. and samples of venous blood and gastric juice were obtained every 15 min for two hr. During the second hr, pentagastrin (6 μg/kg) was given s.c. The samples were analyzed by scintillation counting, and the gastric samples were analyzed by acidity. The rat studies showed no difference in the clearance rates of [^{14}C]-aminopyrine, tritiated quinine, or ^{99m}Tc and indicated a lack of toxicity for the latter. In the human studies, pentagastrin-induced increases in acid secretion were associated with a rise in pertechnetate clearance; the increased clearance tended to precede the rise in acid secretion rate. The mean ^{99m}Tc clearance rate after pentagastrin administration was 70.9 ml/min in the duodenal ulcer patients and 16.6 ml/min in the gastric ulcer patients. The mean clearance rate in the normal subjects was intermediate between these values and low clearance rates were associated with a previous Polya gastrectomy, a gastric carcinoma, and a case of pernicious anemia. In the duodenal ulcer patients, comparison of basal and stimulated ^{99m}Tc clearance with maximal acid output indicated that ^{99m}Tc clearance may be a more precise discriminant of gastric function than acid secretion. The correlation between mucosal ^{99m}Tc clearance and maximal acid output was 0.73 for the human subjects as a group but only 0.29 for the duodenal ulcer patients. The results suggest that pertechnetate clearance is directly related to gastric mucosal blood flow and that its measurement may prove to be a more accurate discriminant in cases of peptic ulceration than the conventional measurement of gastric acid secretion.

8626 A RELATION BETWEEN THE ENERGY OF FOOD AND GASTRIC EMPTYING IN MEN WITH DUODENAL ULCER.

(E.) Stubbs, D. F.; Hunt, J. N. (Guy's Hosp. Medical Sch., London, England). *Gut* 16(9):693-694, 1975.

The half times of gastric emptying of a variety of meals in normal men and in men with duodenal ulcers were compared based on data from nine literature sources. The half times were calculated using a value of 4 Kcal/g of carbohydrate and/or protein/ml of meal and 9 Kcal/g of fat/ml of meal as the energy density of the food or test solution. It was found that the greater the energy density of the meal, the shorter was the observed half time in the patients with duodenal ulcer relative to the normal subjects. At zero calories the difference between the two groups was not significant. The data support the view that the slowing of gastric emptying by duodenal receptors is less in men with duodenal ulcers than it is in healthy men.

8627 LOCATION, HEALING, AND RECURRENCE OF GASTRIC ULCERS IN RELATION TO FUNDAL GASTRITIS.

(E.) Tatsuta, M.; Okuda, S. (Center Adult Diseases, Osaka, Japan). *Gastroenterology* 69(4): 897-902, 1975.

The endoscopic Congo red test was used to study the influence of fundal gastritis on the location, healing, and recurrence of gastric ulcers in 101 outpatients with benign gastric ulcers and 59 patients with healed ulcers. Each patient was given 20 mg of scopolamine butyl-N-bromide s.c. and 40 mg of dimethylpolysiloxane p.o. About 1/2 hr later, Congo red and 5% sodium bicarbonate solution were sprayed into the stomach, AOC-tetragastrin (5 μg/kg) was given, and the gastric mucosa was observed through a gastroscope for 15 to 30 min. Fundal gastritis was classified as absent to severe and gastritic changes were classified as superficial gastritis, atrophic gastritis, or gastric atrophy. All areas of mucosa which were discolored by the Congo red were found to be histologically normal, whereas all nondiscolored areas were either pyloric or fundic mucosa which had been altered by severe superficial or atrophic gastritis. Thirty-three of 40 high-lying ulcers were located in fundic mucosa associated with atrophic gastritis and/or gastric atrophy; none was located in the pyloric mucosa. In contrast, most of the 11 antral ulcers were located in the pyloric mucosa, none being found in fundic mucosa altered by gastritis. There was a close correlation between the extent of fundal gastritis and the location of the gastric ulcer: in general, fundal gastritis was extensive when the ulcers were located in the proximal portion of the stomach near the cardiac orifice. The extent of fundal gastritis was also correlated with the healing of ulcers three months after the beginning of medical treatment; 81.3% of those associated with moderate fundal gastritis and 85.7% of those associated with severe gastritis healed completely within three months. During a two-yr follow-up period, ulcer recurrence was found in 31.8% of the cases studied. While recurrence was observed in only one case in which the original ulcer was not associated with fundal gastritis, the recurrence rate was 58.3% in those with severe gastritis. The results support the view that HCl may be important for the healing of gastric ulcers. They also suggest that factors causing a decrease in the mucosal defensive barrier may be more important for the recurrence of ulcers than aggressive factors such as HCl.

8628 BENIGN GASTRIC ULCER IN A PATIENT WITH PERNICIOUS ANEMIA. *(E.)* Manier, J. W.; Beltaos, E. (Marshfield Clinic, Marshfield, Wisc. 54449). *Gastroenterology* 69(3):744-745, 1975.

A 81-yr-old woman presented with epigastric pain of six-month duration. The presence of a benign gastric ulcer was diagnosed, associated with achlorhydria and documented pernicious anemia. The anemia was established by a Histalog-fast achlorhydria, a Schilling test of 2.1% excretion of tagged vitamin B_{12} in a 24-hr urine, and reticulocytosis after cyanocobalamine administration. Gastric volume was 40 ml, no acid was present, and the pH was 8.1 after the administration of Histalog, 1.5 mg/kg. At gastrectomy the ulcer, which had been demonstrated by gastroscopy, was confirmed. No malignancy was found on histological examination of the ulcer and the remainder of the stomach. It is concluded that the patient suffered from an ulcer, but that it was not acid-produced. It is suggested that bile regurgitation coupled with alcohol ingestion produced the ulcer. Due to the known increased incidence of gastric carcinoma in patients with pernicious anemia, surgical investigation of the ulcer was deemed mandatory.

8629 ANTACID VS PLACEBO IN HOSPITALIZED GASTRIC ULCER PATIENTS: A CONTROLLED THERAPEUTIC STUDY. *(E.)* Butler, M. L.; Gersh, H. (Tripler Army Medical Center, Honolulu, Hawaii). *Am. J. Dig. Dis.* 20(9):803-807, 1975.

In a prospective controlled study, the efficacy of a liquid antacid (a mixture containing 200 mg aluminum hydroxide, 200 mg magnesium hydroxide, and 20 mg simethicone per 5 cc) in relieving pain and promoting healing of gastric ulcers was studied. Gastric ulcer patients were subjected to panendoscopy and mucosal biopsy on hospitalization and three wk after the beginning of antacid or placebo therapy. Medication (1 oz) was given every two hr while the patient was awake. Of the placebo group, eight had healed their ulcers within three wk and two others reduced the size of their ulcers by 2/3 within this period; three failed to heal and underwent surgery. Among the antacid group, eight showed complete healing within three wk, three showed at least a 2/3 reduction in ulcer size, and four required surgery. Of 14 smokers in both groups, healing of the ulcers was achieved in 13. Temporary diarrhea occurred in three antacid and one placebo patient, and only one patient (placebo) complained of pain. Of the seven patients in both groups who required surgery, four were classified as having chronic ulcer disease of three or more months duration and all had relatively large ulcers. It is concluded that in gastric ulcer patients hospitalized for three wk, the rate of healing of the ulcer and the relief of pain are not influenced by treatment with a standard antacid preparation. The rate of healing is not influenced by smoking but does appear to be related to the initial size of the ulcer.

8630 ASPIRIN AND GASTRIC ULCER. *(E.)* Cameron, A. J. (Mayo Clin., Rochester, Minn.). *Mayo Clin. Proc.* 50(10):565-570, 1975.

To determine whether a relation exists between aspirin consumption and gastric ulcer, aspirin intake was studied in 61 patients with roentgenographic and, in some cases, surgical evidence of gastric ulcer and in 17 patients with gastric and duodenal ulcers. A questionnaire and physician interview were used in each case to determine gastrointestinal symptoms and aspirin consumption. Thirty-two of the gastric ulcer patients were regular aspirin users (consuming 15 or more aspirin-containing medications/wk) compared with only six of the 61 control patients. Less frequent aspirin intake was not associated with gastric ulcer. When 21 patients, who took aspirin for abdominal pain or heartburn or in whom the ulcer symptoms began before the start of aspirin usage, were excluded, 18 of the remaining gastric ulcer patients were regular aspirin users compared with only three of their matched controls. Of the 17 patients with both gastric and duodenal ulcers, three were regular users of aspirin while their controls were not; none of the patients who took aspirin regularly used it for ulcer pain. Ulcers associated with regular aspirin use were usually found in the gastric antrum; the incidence of ulcers in this region was significantly higher among regular users than among occasional users or nonusers. Ulcer size was not correlated with aspirin intake. Compared with the occasional users and nonusers, the regular aspirin users were younger and were more often females and nonsmokers. The types of aspirin preparations used by the gastric ulcer patients did not differ from those used by the controls. The findings suggest that aspirin may be a common cause of gastric ulcer in man.

8631 THE EFFECT OF INTRAVENOUS GLUCOSE ON PENTAGASTRIN-INDUCED GASTRIC ACID SECRETION IN MAN. *(E.)* Holst, J. J.; Christiansen, J. (Bispebjerg Hosp., DK-2400, Copenhagen NV, Denmark). *Acta Chir. Scand.* 141(4):289-291, 1975.

The effect of i.v. glucose (50 ml of a 50% glucose solution injected over a 4-min period) on pentagastrin (0.5 μg/kg/hr, i.v. for 3 hr)-induced submaximal gastric acid secretion was investigated in six men and two women with uncomplicated duodenal ulcer and normal glucose tolerance. The patients were fasted overnight and [^{51}Cr]-EDTA was instilled *via* a thin tube into the stomach prior to the beginning of pentagastrin infusion; glucose administration was begun after one hr of pentagastrin infusion. The gastric juice was collected at 15-min intervals for three hr by means of intermittent mechanical suction. In all subjects, steady state secretion was reached after 45 min of pentagastrin infusion. The administration of glucose was completely without effect on the acidity or volume of the gastric juice. The glucose assimilation constant (1.27) was within the normal range. The results indicate that glucose *per se* is not responsible for the previously observed inhibition of gastric acid secretion after intrajejunal glucose.

8632 GELFOAM EMBOLIZATION OF THE LEFT GASTRIC ARTERY FOR BLEEDING ULCER. *(E.)* Gold, R. E.; Grace, M. (Univ. Hosp., Univ. Western Ontario, London, Ontario, Canada). *Radiology* 116(3):575-580, 1975.

A technique for nonoperative treatment of gastrointestinal bleeding, which consists of occluding the bleeding vessel with embolic material injected through a catheter, was employed in dogs to determine its reliability and safety. A bleeding gastric ulcer was surgically created in 18 dogs, and the left gastric artery was successfully catheterized by percutaneous techniques in 15 dogs. Vasopressin infusion was used in the treatment of nine of these dogs; it did not arrest the hemorrhage. A total of 11 dogs underwent embolization with strips of Gelfoam (treatment was subsequent to unsuccessful vasopressin therapy in 5); hemorrhage was stopped by this method in 10 dogs. These results indicate that embolization of left gastric artery branches is a practical, simple and effective way to arrest rapid bleeding in the left gastric arterial distribution. The technique proved effective in lesions not treatable by vasopressin infusion. An advantage is that embolization of a bleeding site permits immediate removal of the catheter. The results indicate that the technique is effective in controlling bleeding and does not result in undue hazard. During embolization of the left gastric artery, intercurrent embolization of hepatic and splenic artery branches occurred in several animals but this was not considered to be a significant factor contributing to their death. Injection of excessive volumes of emboli resulted in a high proportion of the emboli lodging in vessels other than the left gastric artery. Other factors contributing to misplaced emboli were: excessively large volumes of initial embolic material; left gastric artery spasm due to trauma from guide wire or catheter; and increased peripheral resistance due to previous vasopressin infusion. Use of this technique is recommended for poor-risk patients not suitable for surgical therapy in whom a trial of vasopressin therapy has been unsuccessful in controlling hemorrhage.

8633 AN EVALUATION OF SEGMENTAL GASTRECTOMY FOR GASTRIC ULCER: ONE TO TEN YEAR FOLLOW-UP. *(E.)* Sekine, T.; Tsukamoto, M.; Sato, T. (Tohoku Univ. Sch. Medicine, Sendai, 980, Japan). *Surgery* 78(4):508-514, 1975.

To determine the clinical value of segmental gastrectomy for gastric ulcer, 26 of 61 patients subjected to the procedure were followed up for periods of one to ten yr. The follow-up study involved questionnaire reviews, personal interviews, gastric X-ray examinations, histamine-augmented gastric secretion analyses, endoscopic examinations, and determinations of gastric emptying time. Neither the dumping syndrome nor gastric retention were encountered in any of the 26 patients studied. X-ray examination revealed a relatively large gastric remnant with no evidence of either abnormal dilatation or stenosis. The pyloric ring and duodenal bulb were well preserved, with peristaltic activity being maintained in the gastric remnant. The average reduction in maximal acid concentration in the gastric juice after segmental gastrectomy was 58.3%, the average reduction in maximal acid output was 67.1%, and the average reduction in peak acid output was 67.6%. In most of the 26 patients, gastric emptying times were more similar to those in 20 normal subjects than to those in 65 patients with Billroth I or II gastrectomies. Endoscopic visualization revealed a rhythmic contraction and slight dilatation of the pyloric ring after segmental gastrectomy. There was no reddening or erosion in the mucosa of the gastric remnant, nor was there any recurrence of ulcer. The results in these patients indicate the value of segmental gastrectomy in the treatment of gastric ulcer and other benign lesions in the midportion of the stomach.

8634 REVERSIBILITY OF PYLORIC SPHINCTER DYSFUNCTION IN GASTRIC ULCER. *(E.)* Fisher, R. S.; Boden, G. (Temple Univ. Health Sci. Center, Broad and Ontario Sts., Philadelphia, Pa. 19140). *Gastroenterology* 69(3):591-597, 1975.

In order to study both the cause and reversibility of pyloric sphincter dysfunction in gastric ulcer patients, pyloric sphincter pressures were measured in ten normal subjects and in 13 of 20 patients (16 men and 4 women, aged 33-68 yr) with active benign gastric ulcer. Manometric measurements were made before and during gastric acidification. In normal subjects the pyloric sphincter pressure increased significantly in response to the intraduodenal instillation of hypertonic amino acids, sodium oleate, and HCl. Gastric ulcer patients, in contrast, exhibited no significant changes. The mean fasting serum gastrin concentration was significantly higher in the group with gastric ulcer, measuring 89.7 pg/ml, compared to 68.5 pg/ml for controls. Prior to gastric acidification, duodenal infusion of amino acids did not influence the basal pressure of the pyloric sphincter. In contrast, 30 min after the initiation of gastric acidification, amino acids increased pyloric pressure from a basal level of 5 to 13 mm Hg. In normal subjects, sodium oleate and amino acids increased pyloric responses to 12.8 mm Hg and

13.5 mm Hg, resp. In contrast, gastric ulcer patients had pyloric pressure responses of only 4.6 and 5.0 mm Hg, resp. However, during gastric acidification for a minimum of 30 min, these same ulcer patients had normal pyloric pressure responses to the same stimuli (measuring 16.0 and 14.5 mm Hg, resp.). In three additional normal subjects, gastric acidification had no effect on the pyloric responses to hypertonic amino acids and sodium oleate. Gastric acidification did not change the serum gastrin concentrations from fasting values. Mean serum gastrin before acidification was 89.7 pg/ml and after, 93.7 pg/ml. The results of these studies confirmed the suggestion that pyloric sphincter dysfunction occurs in patients with gastric ulcer and that these patients have elevated concentrations of serum gastrin. The findings also demonstrate that pyloric sphincter dysfunction can be reversed by gastric acidification in patients with gastric ulcer. This reversal of pyloric dysfunction is not related to any alteration in the concentration of serum gastrin. The mechanism of pyloric dysfunction in patients with gastric ulcer remains unknown.

8635 EFFECT OF GASTRIC SURGERY ON THE GASTROINTESTINAL DRUG ABSORPTION IN MAN. *(E.)* Venho, V. M. K.; Aukee, S.; Jussila, J.; Mattila, M. J. (Dept. Pharmacology, Univ. Helsinki, Siltavuorenpenger 10, SF-00170 Helsinki 17, Finland). *Scand. J. Gastroenterol.* 10(1):43-47, 1975.

The effect of gastric surgery on the absorption of quinidine (0.2 g, p.o.), ethambutol (25 mg/kg, p.o.), and sulphafurazole (1.0 g, p.o.) was studied in 14 men hospitalized for surgical treatment of ulcer disease. The drug absorption tests and a betazole test of basal and maximal acid output (after Histalog administration, 1.5 mg/kg) were performed before and an average of 2.5 months after antrectomy with gastroduodenostomy (ABI, 2 patients), antrectomy with gastroduodenostomy and selective vagotomy (10 patients), selective vagotomy (1 patient), or pyloroplasty (1 patient). Serum drug concentrations were measured 0 to 6 hr after drug administration and the urinary drug concentrations were measured six hr after drug administration. ABI and selective vagotomy lowered the serum levels of all drugs significantly at all time periods; the effect on quinidine and sulphafurazole was more pronounced than that on ethambutol. The urinary excretion of all drugs was also decreased after ABI with vagotomy, but only the decreases in quinidine and sulphafurazole excretion were significant. In three patients retested 10 to 16 mo after the postoperative test, the serum concentrations of all drugs were still significantly lowered compared with preoperative values. The excretion of quinidine and sulphafurazole in the urine was also significantly lowered, but the urinary excretion of ethambutol was increased over preoperative levels. In the patients treated with ABI alone, there were no changes in the serum or urinary drug concentrations postoperatively. In two of three patients with preoperative gastric retention, there was a tendency toward slightly improved absorption after surgery. Basal and maximal acid secretion decreased markedly after ABI with vagotomy and in the patients with preoperative gastric retention; this was associated with an increase in pH. Acid secretion and pH were unchanged after ABI alone. The data indicate that factors other than pH are important in drug absorption. The retarded absorption after ABI with vagotomy can lead to failures in peroral drug treatment in the months immediately following surgery.

8636 GASTRIN, G CELLS, AND GASTRIC ACID IN RATS WITH SECRETAGOGUE-PRODUCED AND ANTI-SECRETAGOGUE-INHIBITED DUODENAL ULCERS [abstract]. *(E.)* Joffe, S. N.; Gaskin, R.; Barros D'Sa, A. A. J.; Polak, M.; Bloom, S. R.; Baron, J. H. (R. Postgrad. Med. Sch., London, England). *Gut* 16(5):407, 1975.

8637 TISSUE GASTRIN IN PEPTIC ULCERATION [abstract]. *(E.)* Connon, J. J.; Ardill, J.; McFarland, R. J. (Belfast City Hosp., Belfast, Ireland). *Gut* 16(5):407, 1975.

8638 THE VALUE OF BRUSH CYTOLOGY IN THE DIAGNOSIS OF GASTRIC CANCER [abstract]. *(E.)* Smithies, A.; Lovell, D.; Hishon, S.; Kellock, T. D.; Misiewicz, J. J.; Newton, C.; Pounder, R. E.; Blendis, L. M. (Central Middlesex Hosp., Park Royal, London, England). *Gut* 16(5):395, 1975.

8639 PYLORIC SPHINCTER PRESSURE (PSP) STUDIES. EFFECT OF CIGARET SMOKING, ATROPINE AND METOCLOPRAMIDE [abstract]. *(E.)* Valenzuela, J. E.; Defilippi, C.; Csendes, A. (Univ. Chile Sch. Med., Santiago, Chile). *Gastroenterology* 68(4):1064, 1975.

8640 GASTRIC ULCERS PRODUCED IN CATS BY PROLONGED INTRAVENOUS INFUSION OF ASPIRIN [abstract]. *(E.)* Bugat, R.; Thompson, M. R.; Grossman, M. I. (VA Wadsworth Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):1057, 1975.

8641 ELECTROCOAGULATION IN UPPER GASTROINTESTINAL HEMORRHAGE: A TWO YEAR EXPERIENCE [abstract]. *(E.)* Papp, J. P. (Blodgett Mem. Hosp., Grand Rapids, Mich.). *Gastroenterology* 68(4):1040, 1975.

8642 EFFECT OF ORAL 16, 16 DIMETHYL PROSTAGLANDIN E_2 (PGE_2) ON MEAL-STIMULATED GASTRIC ACID SECRETION IN DUODENAL ULCER PATIENTS [abstract]. *(E.)* Ippoliti, A.; Walsh, J. H.; Isenberg, J. I. (Wadsworth VA Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):918, 1975.

8643 GASTRIC PROSTAGLANDIN E (PGE) OUTPUT DURING BASAL AND STIMULATED ACID SCRETION IN NORMAL SUBJECTS AND PATIENTS WITH PEPTIC ULCER [abstract]. *(E.)* Cheung, L. Y.; Jubiz, W.; Moore, J. G.; Frailey, J. (Univ. Utah Coll. Med., Salt Lake City). *Gastroenterology* 68(4):873, 1975.

8644 GASTROCOLIC FISTULA COMPLICATING BENIGN ULCER [abstract]. *(E.)* Morton, R. E. (Univ. Miami Sch. Med., Miami, Fla.). *Gastroenterology* 68(4):1038, 1975.

8645 QUALITATIVE COMPARISON OF ENDOSCOPY AND RADIOLOGY IN THE DIAGNOSIS OF DUODENAL ULCER [abstract]. *(E.)* Shirakabe, H.; Nishizawa, M.; Nomoto, K.; Ariyama, J.; Hamilton, G. B. (Dept. Gastroenterol., Juntendo Univ., Tokyo, Japan). *Gastroenterology* 68(4):1031, 1975.

8646 DUODENAL ULCERS PRODUCED BY NONSTEROIDAL ANTIINFLAMMATORY COMPOUNDS PLUS BILE DUCT LIGATION [abstract].*(E.)* Robert, A.; Nezamis, J. E.; Lancaster, C. (Dep. Exp. Biol., Upjohn Co., Kalamazoo, Mich.). *Gastroenterology* 68(4):973, 1975.

8647 THE ROLE OF GASTRIC INHIBITORY POLYPEPTIDE IN DUODENAL ULCER [abstract]. *(E.)* Cataland, S.; Brooks, R.; Odorisio, T.; Mekhjian, H. S. (Ohio St. Univ. Dep. Med., Columbus, Ohio). *Gastroenterology* 68(4):871, 1975.

8648 PANCREATIC BICARBONATE SECRETION AND SERUM SECRETIN IN RESPONSE TO GRADED AMOUNTS OF DUODENAL ACIDIFICATION IN DUODENAL ULCER AND NORMAL SUBJECTS [abstract]. *(E.)* Cano, R.; Bloom, S. R.; Isenberg, J. I. (Wadsworth VA Hosp., Los Angeles, Calif.). *Gastroenterology* 68(4):870, 1975.

8649 EXPERIENCE WITH ESOPHAGOGASTRODUODENOSCOPY IN DIAGNOSIS OF 79 PEDIATRIC PATIENTS WITH HEMATEMESIS, MELENA OR CHRONIC ABDOMINAL PAIN [abstract]. *(E.)* Ament, M. E.; Gans, S. L.; Christie, D. L. (UCLA Medical Sch., Los Angeles, Calif.). *Gastroenterology* 68(4):858, 1975.

8650 ANTI-GASTRIN THERAPY IN PEPTIC ULCER DISEASE [abstract]. *(E.)* Plata, A. A. (Hosp. La Samaritana, Bogota, Colombia). *Gastroenterology* 68(4):858, 1975.

8651 VAGOTOMY AND ORGAN-SPARING IN TREATMENT OF ULCER DISEASE. *(Rus.)* Fuks, B. I.; Perkin, E. M.; Getta, A. I.; Kozlov, V. I.; Varfolomeyev, A. M.; Dyachuk, V. D.; Nishchyi, V. A. (Clinic Surgery, Novokuznetsk Inst. Postgraduate Training Physicians, Municipal Hosp. 1, USSR). *Khirurgiia* (4):32-35, 1974.

8652 CONDITION OF GASTRIC SECRETION IN DUODENAL ULCER IN CHILDREN. *(Rus.)* Belousov, Y. V. (First Dept. Pediatrics, Ukrainian Inst. Postgraduate Training Physicians, USSR). *Radiol. Diagn.* (3):26-29, 1975.

8653 PEPTIC ULCERS IN CHILDREN. *(Rus.)* Glazyrina, V. N.; Korolkova, O. I.; Malkevich, N. P. (Dept. Acute Childhood Infections, M. F. Vladimirskiy Moscow Regional Scientific Res. Clinical Inst., USSR). *Vorp. Okhr. Materin. Det.* 20(3):28-32, 1975.

8654 THE FUNCTION OF THE HYPOPHYSIAL-ADRENAL SYSTEM IN PATIENTS WITH GASTRODUODENAL ULCER. *(Rus.)* Berezov, Y. E.; Pinsky, S. B.; Bratslavsky, A. M. (Second Dept. Therapy Postgraduate Training Physicians, S. M. Kirov Military Medical Acad., Leningrad, USSR). *Sov. Med.* (2):8-13, 1975.

8655 EFFECT OF ADRENOBLOCKING SUBSTANCES ON GASTRIC SECRETION AND INTRAGASTRIC pH IN PATIENTS WITH PEPTIC ULCER. *(Rus.)* Lisovsky, V. A.; Uspensky, S. P. (Second Dept. Therapy, S. M. Kirov Military Medical Acad., Leningrad, USSR). *Ter. Arkh.* 46(9):103-106, 1974.

8656 SPONTANEOUS FORMATION OF A CHOLEDOCHO-GASTRIC FISTULA. *(Ger.)* Bottcher, J.; Horstkotte, W. (Diagnostiches Strahleninstitut des Allgemeinen Krakenhauses St. Georg, Hamburg, Germany). *Leber Magen Darm* 5(1):21-24, 1975.

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8658 ENTEROCHROMAFFINE CELLS OF THE DUODENAL MUCOSA IN SOME KINDS OF GASTRODUODENAL PATHOLOGY. *(Rus.)* Uspensky, V. M. (Dept. Hospital Therapy, S. M. Kirov Military Medical Acad., Leningrad, USSR). *Ter. Arkh.* 47(2):39-42, 1975.

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8661 INADEQUATE CLOSURE OF THE PYLORIC SPHINCTER IN THE PATHOGENESIS OF GASTRIC ULCER. DISCUSSION OF Ia. D. VITEBSKII'S ARTICLE, "NEW SURGICAL TECHNIQUE FOR THE TREATMENT OF GASTRIC AND DUODENAL ULCERS." *(Rus.)* Chervinskii, A. A.; Miasnikov, A. D.; Firsov, E. F.; Pavlov, V. K.; Iakirevich, E. L. (Kursk Medical Inst., USSR). *Klin. Khir.* (6):66-68, 1975.

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8666 INVESTIGATION OF THE RELATIONSHIP OF HCl AND PEPSIN SECRETION AFTER PENTAGASTRIN AND INSULIN IN PATIENTS WITH DUODENAL ULCERS. II. *(Cz.)* Pelikan, V.; Horcicka, V.; Komenda, S.; Vrublivsky, P. (Fac. Med. Palacky Univ., Olomouc, Czechoslovakia). *Cesk. Gastroenterol. Vyz.* 28(6):409-414, 1974.

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8675 THE POSSIBILITY OF DIETARY PROTECTIVE FACTORS IN DUODENAL ULCER. *(Eng.)* Tovey, F. I.; Jayaraj, A. P.; Clark, C. G. (Univ. Coll. Hosp. Medical Sch., London, England). *Postgrad. Med. J.* 51(596):366-372, 1975.

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8677 CHEMICAL FACTORS IN AETIOLOGY OF DUODENAL ULCER [letter to editor]. *(Eng.)* Szabo, S.; Reynolds, E. S.; Moslen, M. T. (Harvard Medical Sch., Boston, Mass. 02115). *Lancet* 2(7924):73, 1975.

8678 CHILDREN WITH DUODENAL ULCERS AND THEIR FAMILIES. *(Eng.)* Puri, P.; Boyd, E. (Our Lady's Hosp. for Sick Children, Crumlin, Dublin, Eire). *Arch. Dis. Child.* 50(6):485-486, 1975.

8679 BIOLOGICAL ACTIVITY AND CLEARANCE OF HUMAN BIG GASTRIN IN MAN [abstract]. *(Eng.)* Walsh, J. H.; Maxwell, V.; Isenberg, J. I. (UCLA Med. Sch., Los Angeles, Calif.). *Clin. Res.* 23(3):259A, 1975.

8680 PERFORATED PEPTIC ULCER: ANALYSIS OF 100 CONSECUTIVE CASES. *(Por.)* Martins, A.; Quaglia, S.; Godoy, A. C.; Sugahara, M.; Goffi, F. S. (Hospital Servidor Publico Estado, Sao Paulo, Brazil) *An. Paul. Med. Cir.* 102(4):147-152, 1975.

See also, 8134, 8152, 8166, 8197, 8452, 8464, 8472, 8528, 8537, 8550, 8558, 8560, 8563, 8578, 8586, 8588, 8601, 8608, 8611, 8612, 8621, 8689, 8705, 8718, 8871, 8999, 9013, 9318, 9330, 9338.

8681 AN INTESTINAL DISEASE PRODUCED EXPERIMENTALLY BY A PROSTAGLANDIN DEFICIENCY. *(E.)*

Robert, A. (Dept. Experimental Biology, Upjohn Co., Kalamazoo, Mich. 49001). *Gastroenterology* 69(4): 1045-1047, 1975.

To determine whether the severe intestinal syndrome produced in rats by certain nonsteroidal anti-inflammatory compounds is due to the prostaglandin deficiency elicited by these agents, prostaglandins were administered (p.o. or s.c. twice daily for three days, once p.o., or by constant s.c. infusion) to female Upjohn rats treated with a single p.o. dose of indomethacin (10 mg/kg in the fed rats and 20 mg/kg in the fasted rats). All prostaglandins tested inhibited the formation of intestinal lesions caused by indomethacin, the degree of protection being dose-dependent. The A and E type prostaglandins were the most potent in this respect, and a dimethyl group at C-16 increased the activity of prostaglandin E_2 and prostaglandin F_{2_α}, while derivative formation, as in the 15-acetate and 15-methyl ester of prostaglandin A_2, greatly decreased activity. Several prostaglandins, notably prostaglandin E_2, were more active p.o. than s.c. When given as a single p.o. dose, 16,16-dimethyl prostaglandin E_2 offered complete protection when given 30 min after indomethacin and nearly complete protection when given 30 min before, with, and one hr after indomethacin. The incidence of lesions rose when the prostaglandin was given more than one hr after indomethacin, reaching near maximum when given four hr later. However, the severity of the lesions was greatly reduced when the prostaglandin was administered up to six hr after indomethacin. When prostaglandin was given 24 hr after indomethacin, the incidence of adhesions was roughly the same as in controls treated with indomethacin alone. Prostaglandin treatment appears to prevent the intestinal syndrome caused by the nonsteroidal anti-inflammatory compounds by preventing the prostaglandin deficiency produced by these agents.

8682 THE RATE OF WEIGHT LOSS AFTER INTESTINAL BYPASS OPERATIONS FOR OBESITY. AN ANALYSIS OF FACTORS OF SIGNIFICANCE. *(E.)*

Backman, L. (Dept. Surgery, Karolinska Sjukhuset, Stockholm, Sweden). *Acta Chir. Scand.* 141(5):424-430, 1975.

Relations between the rate and amount of weight loss were studied in 61 women and 19 men following intestinal bypass operations for obesity. End-to-side jejuno-ileostomies were performed in 19 patients, and end-to-end jejuno-ileostomies with ileocecostomies were performed in the remaining 61. Determinations were made of body height, weight, surface area, weight-index, small intestinal length, and the rate of weight loss (*b*-value). The postoperative period was subdivided into five periods: during period I, the patients lost weight rapidly; period II was characterized by a linear course; the curve leveled off during period III; weight increased during period IV; and weight stabilized in period V. Period II was characterized by a *b*-value of 0.011 weight-index units or 0.79 kg/week; the mean duration of this period was 44.3 weeks and the total weight loss in the whole series was 0.74 weight-index units or 50.7 kg. Although the end-to-end procedure was followed by a slightly higher *b*-value than the end-to-side procedure, the difference was not significant. Significant correlations were found between body weight and *b*-value after both procedures and between *b*-value and the length of the distal ileum (both absolute length and length compared with that of the total small intestinal length) after the end-to-end procedure; there was no correlation between *b*-value and length of the distal ileum after the end-to-side procedure. Total weight loss in periods I to III was positively and significantly correlated with the *b*-value after the end-to-side procedure. The length of the jejunal segment in function was probably not a determining factor in the weight loss when a 30 to 60 cm jejunal segment was used. The authors suggest that the functional capacity of certain segments of a long, small intestine might be inferior to that of a shorter segment. In addition, it is suggested that a small intestinal bypass operation be performed not as a standardized procedure with predetermined segments of the small intestine in function, but rather as an operation tailored for each patient.

8683 NON SPECIFIC DUODENITIS. A STUDY OF 80 CASES. *(Fr.)*

Chaput, J. C.; Petite, J. P.; Rain, B.; Buffet, C.; Camillieri, J. P.; Etienne, J. P. (Service d'Hepatologie et de Gastroenterologie Hopital Antoine-Beclere, 157, rue de la Porte-de-Trivaux, Clarmart, France). *Arch. Fr. Mal. App. Dig.* 63(8):611-623, 1974.

Nonspecific duodenitis was studied in 80 patients by the use of endoscopic observation and directed biopsy (duodenal and gastric x-rays as well as gastric acid secretions). Of the patient pool, 86.2% were males; a control population of 16 patients suffering from a growing bulbous ulcer was set up. The use of biopsy was stressed since in some histologically-proven duodenitis no clinical, endoscopic or radiographic abnormality indicated such diagnosis. Subdivisions were made as follows: (1) normal duodenum, (2) simple erythematic duodenitis (without fold modification), (3) erythematic duodenitis with generous folds, and (4) erosive duodenitis. Discordances arose when histologically normal duodenums were found in patients with endoscopic abnormalities, suggesting that histological lesions may be located in "regions," or suggesting vascular congestion without histological inflammation. The gastric acid level was higher in histologically observed duodenitis as opposed to normal endoscopic observation. Alcoholism seemed to correlate positively with endoscopically proven duodenitis. Duodenitis is likely to surround an evolutive ulcer, but it is not known whether duodenitis is the only anatomical substrate on which an ulcer may develop.

8684 ISCHAEMIC NECROSIS OF THE SMALL BOWEL IN A CASE OF MALIGNANT HYPERTENSION. *(E.)*

Corbett, R. H. (Western Infirmary, Glasgow G11 6NT, Scotland). *Br. J. Radiol.* 48(574):860-862, 1975.

A case report of a 20-yr-old man with radiologically demonstrable changes in the small bowel, ischemic necrosis of the small intestine and malignant hypertension is discussed. The patient presented with acute abdominal pain, steadily deteriorating vision in both eyes, and a supine blood pressure of 260/160. Barium examination showed a markedly abnormal terminal ileum (30 cm in length) with loss of fold pattern in a dilated segment and with widespread ulceration and narrowing in the adjacent loop. Pathological examination confirmed the extensive ulceration; mucosal edema suggested the absence of any mucosal fold pattern. Both plasmatic vasculosis and acute vasculitis with abundant polymorphs were present in the submucosal vessels. Resection of the terminal ileum was followed by a steady improvement in vision and blood pressure. The cause of the malignant hypertension involving the intestine could not be determined. Arteriography revealed two right renal arteries but no obvious renal artery stenosis, nor was stenosis seen at laparotomy. Divided renal function studies and angiotensin II estimations were normal. There was no evidence of a collagen disease, microangiopathic hemolytic anemia, or a pheochromocytoma. Fibrinoid degradation products were normal. This is the second case of abdominal pain and malignant hypertension occurring in a young patient. It is suggested that such patients undergo a barium meal and follow-through examination to exclude a vascular origin for the abdominal pain.

8685 STUDIES ON SMALL INTESTINAL OBSTRUCTION. I. INTRALUMINAL PRESSURE IN EXPERIMENTAL LOW SMALL BOWEL OBSTRUCTION IN THE CAT. *(E.)* Ohman, U. (Dept. Surgery, Karolinska Sjukhuset, Stockholm, Sweden). *Acta Chir. Scand.* 141(5):413-416, 1975.

The type and magnitude of intraintestinal pressure was recorded with open-tip catheters in cats with small intestine obstruction induced by ligation of the terminal ileum. Resting pressure before obstruction was 2 to 4 mm Hg. After obstruction of 72 hr duration, sustained intraluminal pressure ranged from 5 to 10 mm Hg. Long periods of inactivity alternated with short bouts of spontaneous intestinal activity. Both type I and type III waves were recorded during this activity, and the pressure rose to about 20 mm Hg. Activity that was principally type III was elicited by cholecystokinin (2 Ivy dog U/kg). In motility responses induced by this agent, pressure waves rose momentarily to values in the 40 to 50 mm Hg range. Considerable intestinal distention was the principal finding upon opening the abdominal cavity; there were no macroscopic signs of nonviability of the intestinal wall. Although the magnitude of the sustained luminal pressure induced by small intestine obstruction is rather modest, the combined mechanisms of distension and raised intraluminal pressure may have a detrimental effect on the mucosal microcirculation.

8686 STUDIES ON SMALL INTESTINAL OBSTRUCTION. II. BLOOD FLOW, VASCULAR RESISTANCE, CAPILLARY FILTRATION, AND OXYGEN CONSUMPTION IN DENERVATED SMALL BOWEL AFTER OBSTRUCTION. *(E.)* Ohman, U. (Dept. Surgery, Karolinska Sjukhuset, Stockholm, Sweden). *Acta Chir. Scand.* 141(5):417-423, 1975.

To assess the viability of the feline small intestine after 72 hr of simple obstruction (*via* umbilical tape tied around the terminal ileum), capillary filtration and oxygen consumption were determined during *in vitro* homologous perfusion of the intestine 30 min after release of the obstruction. After homologous perfusion and relief of the obstruction, the intestinal specimen was transferred to an organ chamber. During the course of obstruction, the animals lost weight (mean, 7.5%); the small intestines were considerably distended and presented the classical appearance of simple bowel obstruction. No macroscopic signs of nonviability were observed. During the perfusion procedure, the host animals provided mean arterial pressures of about 100 mm Hg. The resulting mean flow rates were 45 to 50 ml/min/100 g, and the vascular resistance averaged about 2.5 PRU. Capillary filtration showed a mean of about 0.1 and the mean oxygen consumption was about 3 ml/min/100 g. The obstructed intestines did not differ significantly from nonobstructed control intestines in any of these parameters. The results indicate that the alleged microcirculatory impairment caused by an experimental, low, small intestine obstruction is rapidly ameliorated following decompression of the bowel. Thus, the bowel microvasculature appears to have a considerable functional reserve.

8687 ADHERENCE OF ENTEROPATHOGENIC Escherichia coli TO INTESTINAL EPITHELIUM IN VIVO. *(Eng.)* Hohmann, A.; Wilson, M. R. (Ontario Veterinary Coll., Univ. Guelph, Ontario, Canada). *Infect. Immun.* 12(4):866-880, 1975.

Two porcine stains of enteropathogenic *Escherichia coli*, one possessing K88 antigen (strain P155) and one lacking K88 (strain 340), were compared with respect to their ability to proliferate in the small intestine and to adhere to the intestinal epithelial surface *in vivo*. Twelve piglets were infected p.o. with 1 ml of saline suspension containing 10^{10} bacteria at about four hr postpartum. The animals were killed at 12, 13, or 14 hr postinfection and bacteriological cultures were made from rectal swabs, spleen, and liver. The small intestine was examined by scanning and transmission electron microscopy, and bacterial counts were obtained from the walls of normal and infected intestines. Although both strains of *E. coli* caused severe diarrhea, only the K88-possessing strain was able to proliferate in the anterior small intestine. Both strains proliferated equally well in the posterior segments of the small intestine, and with both strains, significantly greater numbers of organisms were recovered from the homogenized intestinal wall than were recovered from the luminal contents. Transmission and scanning electron microscopy revealed large numbers of bacteria adhering to the epithelial surface in the posterior intestinal region. Although electron microscopy did not reveal the adhesive mechanism of either strain of *E. coli*, shadow-cast preparations demonstrated an unusual appendage on the cells of strain 340. These appendages appeared as 1 to 6 μm-long strands which were 80 to 100 nm wide at the base and became thinner at their extremities; these strands were usually branched. The number of *E. coli* recovered from the duodenums of pigs infected with strain 340 did not significantly exceed that from noninfected controls. The data cast doubt on the necessity for proliferation of *E. coli* in the anterior small intestine as an essential step in the pathogenesis of porcine enteric colibacillosis.

8688 EFFECT OF FOOD INTAKE AND THE PITUITARY ON INTESTINAL STRUCTURE AND FUNCTION AFTER SMALL BOWEL RESECTION IN THE RAT [abstract]. *(E.)* Taylor, B.; Murphy, G. M.; Dowling, R. H. (Guy's Hosp., London, England). *Gut* 16(5):397-398, 1975.

8689 THE PATHOPHYSIOLOGY OF DUODENITIS [abstract]. *(E.)* Donovan, I. A.; Green, G.; Dykes, P. W.; Owens, C.; Glendinnen, B. G.; Alexander-Williams, J. (Gen. Hosp., Birmingham, England). *Gut* 16(5):395, 1975.

8690 PATCHINESS OF THE MUCOSAL ABNORMALITY IN COELIAC DISEASE (CD) AND DERMATITIS HERPETIFORMIS (DH) [abstract]. *(E.)* Scott, B. B.; Losowsky, M. S. (St. James's Hosp., Leeds, England). *Gut* 16(5):393, 1975.

8691 JEJUNAL COLONIZATION WITH ENTEROBACTERIA IN SYMPTOMATIC TROPICAL RESIDENTS WITHOUT ACUTE SPRUE [abstract]. *(E.)* Tomkins, A. M.; Wright, S.; James, W. P. T.; Drasar, B. S. (London Sch. Hygiene and Tropical Med., London, England). *Gut* 16 (5):392, 1975.

8692 LITHOGENIC AND HEPATOTOXIC POTENTIAL IN INTESTINAL BY-PASS: BILE ACID AND STEROL CHANGES [abstract]. *(E.)* Faloon, W. W.; Bubulis, A.; Flood, M. S. (Highland Hosp., Rochester, N.Y.). *Gastroenterology* 68(4):1073, 1975.

8693 PROTEIN DIGESTION AND ABSORPTION AFTER SMALL BOWEL RESECTION [abstract]. *(E.)* Curtis, K. J.; Kim, Y. S. (VA Hosp., San Francisco, Calif.). *Gastroenterology* 68(4):1071, 1975.

8694 DOUBLE BLIND EVALUATION OF 2 HYPOTONIC DRUGS FOR DUODENOSCOPY AND DUODENOGRAPHY [abstract]. *(E.)* Bertrand, G.; Woods, R. E.; Raheja, K. L.; Linscheer, W. G. (VA Hosp., Syracuse, N.Y.). *Gastroenterology* 68(4):1069, 1975.

8695 HAMARTOMA OF BRUNNER'S GLAND: ENDOSCOPIC DIAGNOSIS [abstract]. *(E.)* Rider, J. A.; Puletti, E. J.; Rider, R. D.; Harnchonboth, K. (Ralph K. Davies Med. Cent. Franklin Hosp., San Francisco, Calif.). *Gastroenterology* 68(4):1043, 1975.

8696 DUODENITIS, ENDOSCOPIC AND HISTOPATHOLOGICAL CORRELATION [abstract]. *(E.)* Ramierz-Degollado, J.; Garcia, J. A. (Gen. Hosp., National Medical Center, IMMS., Mexico). *Gastroenterology* 68(4):1042, 1975.

8697 EFFECT OF SMALL AMOUNTS OF ANTACIDS ON CALCIUM, PHOSPHORUS, AND FLUORIDE METABOLISM IN MAN [abstract]. *(E.)* Spencer, H.; Norris, C.; Coffey, J.; Wiatrowski, E. (VA Hosp., Hines, Ill.). *Gastroenterology* 68(4):990, 1975.

8698 INFLUENCE OF PITUITARY HORMONES ON INTESTINAL STRUCTURE AND FUNCTION AFTER SMALL BOWEL RESECTION IN THE RAT [abstract]. *(E.)* Taylor, B.; Murphy, G. M.; Dowling, R. H. (Guy's Hosp., London, England). *Gastroenterology* 68(4):887, 1975.

8699 INTESTINAL SECRETION IN ACUTE ENTERITIS. A FUNCTION OF CRYPT-TYPE ENTEROCYTES [abstract]. *(E.)* Kerzner, B.; McClung, J.; Kelly, M.; Butler, D.; Gall, G.; Hamilton, R. (Hosp. for Sick Children, Toronto, Ontario, Canada). *Gastroenterology* 68(4):909, 1975.

8700 FREE AMINO ACID AND DIPEPTIDE ABSORPTION IN THE JEJUNUM OF PATIENTS WITH JEJUNOILEAL BYPASS FOR OBESITY [abstract]. *(E.)* Fogel, M. R.; Ravitch, M. M.; Adibi, S. A. (Montefiore Hosp., Pittsburgh, Pa.). *Gastroenterology* 68(4):894, 1975.

8701 AMPULLARY CARCINOMA [abstract]. *(E.)* Norton, R. A.; Paul, R. E.; Miller, H. H.; Kaplan, M. M. (Tufts-New Engl. Med. Cent., Boston, Mass.). *Gastroenterology* 68(4):1039, 1975.

8702 THE FUNCTION OF ANTIBODY IN LOCAL IMMUNITY IN THE SMALL BOWEL. *(E.)* Burrows, W. (Dept. Microbiology, Univ. Chicago, Chicago, Ill., 60637). *Immunochemistry* 12(6/7):621-623, 1975.

8703 THE PATHOGENESIS OF INTESTINAL ATRESIA. *(E.)* Guttman, F. M.; Bensoussan, A. L.; Blanchard, H.; Desjardins, J. G.; Collin, P. P. (Sainte-Justine Hosp. for Children, Montreal, Canada). *Surg. Gynecol. Obstet.* 141(2):203-206. 1975.

8704 ADENOCARCINOMA OF THE JEJUNUM IN AN 18-YEAR-OLD PATIENT: A CASE REPORT. *(E.)* Voegele, L. D.; Moncrief, J. A. (Medical Univ. South Carolina, 80 Barret St., Charleston, S. C. 29401). *Surgery* 78(2):251-253, 1975.

8705 ACUTE POSTOPERATIVE WOUND COMPLICATIONS AFTER GASTRIC SURGERY FOR MORBID OBESITY. *(E.)* Printen, K. J.; Paulk, S. C.; Mason, E. E. (Univ. Hosp., Iowa City, Iowa 52242). *Am. Surg.* 41(8):483-485, 1975.

8706 COMPLICATIONS OF JEJUNOILEAL BYPASS FOR MORBID OBESITY. *(E.)* Jewell, W. R.; Hermreck, A. S.; Hardin, C. A. (Univ. Kansas Medical Center, Rainbow Blvd. at 39th St., Kansas City, Kans. 66103). *Arch. Surg.* 110(8):1039-1042, 1975.

8707 REDUCTION IN VOLUME, ELECTROLYTES, PANCREATIC ENZYMES AND BILE SALTS IN ILEAL FISTULA DRAINAGE DURING INGESTION OF AN ELEMENTAL DIET. *(E.)* Hill, G. L.; Mair, W. S. J.; Edwards, J. P.; Goligher, J. C. (Univ. Dept. Surg., General Infirmary, Leeds, England). *Fed. Proc.* 34(3):931, 1975.

8708 INVESTIGATION OF FOLATE POLYGLUTAMATE HYDROLYSIS IN MAN: COMPARISON OF PROXIMAL SMALL INTESTINAL CONTENTS WITH MUCOSAL HOMOGENATES [abstract]. *(E.)* Graham, D. Y.; Godwin, H. A. (Baylor Coll. Med., Houston, Texas). *Clin. Res.* 23(3):249A, 1975.

8709 RETROGRADE VENOUS DELIVERY OF STEROIDS FOR LYSOSOMAL STABILIZATION IN ISCHEMIC BOWEL DISEASE [abstract]. *(E.)* Katz, S.; Williams, L. F. (Boston Univ. Sch. Med., Boston, Mass.). *Clin. Res.* 23(3):252A, 1975.

8710 GLUTEN-SENSITIVE ENTEROPATHY: CORRELATION OF ORGAN CULTURE BEHAVIOR WITH HL-A STATUS [abstract]. *(E.)* Nelson, D. L.; Falchuk, Z. M.; Kasarda, D.; Strober, W. (Natl. Inst. of Health, Bethesda, Md.). *Clin. Res.* 23(3):254A, 1975.

8711 ENTERIC INFECTION WITH COXSACKIEVIRUS B5 DECREASES INTESTINAL EPITHELIAL CELL MIGRATION RATE [abstract]. *(E.)* Broitman, S. A.; Loria, R. M.; Kibrick, S. (Boston Univ. Sch. Med., Boston, Mass.). *Clin. Res.* 23(3):256A, 1975.

8712 CONTRIBUTION TO THE QUESTION OF DUODENOBILIARY REFLUX OF CONTRAST SUBSTANCE DURING ROUTINE GASTRODUODENAL EXAMINATION. *(Cz.)* Vitovec, J. (Regional Public Health Inst., Karlovy Vary, Czechoslovakia). *Cs. Radiol.* 29(2):126-130, 1975.

8713 AN AUTOPSY CASE OF PRIMARY LEIOMYOSARCOMA OF THE DUODENUM WITH A STATISTICAL REVIEW OF A LARGE SERIES OF JAPANESE AUTOPSY CASES: *(Jpn.)* Tanimura, A.; Yamamoto, H.; Yamaguchi, T.; Shibata, H.; Nakashima, T.; Urabe, K. (Kurume Univ. Sch. Medicine, Kurume, Japan). *Gan No Rinsho* 21(3):214-219, 1975.

8714 RADIOLOGICAL FINDINGS IN CASE OF HAEMORRHAGES FROM THE SMALL INTESTINE. *(Ger.)* Dombrowski, H. (Rontgenabteilung der Medizinischen Universitatsklinik Marburg, Marburg, Germany). *Diagnostik* 8(2):51-54, 1975.

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8716 THE INTRAMURAL HAEMATOMA OF THE SMALL GUT. A RARE COMPLICATION OF ANTICOAGULANT THERAPY. *(Fr.)* Van Cauter, J.; Quintard, N.; Daubresse, J. C.; Docquier, P.; Meunier, R. (Hopital Civil, Charleroi, Belgium). *Acta Gastroenterol. Belg.* 37(10-11):503-507, 1974.

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8719 A NEW MODIFICATION OF OPERATION FOR ALIMENTATIVE JEJUNOSTOMY. *(Pol.)* Jezioro, Z.; Bernat, M.; Zimmer, Z. (Z. Kliniki Chirurgii Przewodu Pokarmowego Instytutu Chirurgii AM we Wroclawiu, Poland). *Pol. Przegl. Chir.* 47(4):517-520, 1975.

8720 NOTES ON THE PHYSIOPATHOLOGICAL AND CLINICAL ASPECTS OF MASSIVE RESECTION OF THE SMALL INTESTINE. *(It.)* Rinetti, M.; Lenzi, S. (Medical Clinic, Univ. Parma, Parma, Italy). *Minerva Gastroenterol.* 20(4):137-147, 1974.

8721 INTESTINAL POLYPOSES. *(Fr.)* Quinton, A.; Dubarry, B. (Hopital Saint-Andre, 1, rue Jean-Burguet, F 33000 Bordeaux, France). *Bordeaux Med.* 8(7):727-736, 1975.

8722 INTESTINAL BYPASS IN THE SURGICAL TREATMENT OF MORBID OBESITY. *(It.)* Doldi, B. S.; Donati, L.; Germiniani, R.; Klinger, R.; Annoni, F.; Mori, G.; Montorsi, W. (Inst. Semeiot. Surg., Univ. Milan, Italy). *Terapia* 59(430):187-199, 1974.

8723 ULCERATED ILEAL DUPLICATION AS AN UNUSUAL CAUSE OF INTESTINAL BLEEDING IN ADULTS. *(Ger.)* Ammann, J.; Scharli, A.; Vogt, B. (Kantonsspital Luzern, CH-6000 Luzern, Switzerland). *Chirurg* 46:76-78, 1975.

8724 LYMPHOMA AS A CAUSE OF INTESTINAL INTUSSUSCEPTION. *(Sp.)* Garcia Aroca, J.; Ollero Caprani, J. M. (Hospital Nino Jesus, Madrid, Spain). *Acta Pediatr. Esp.* 33(387):107-110, 1975.

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8726 INTESTINAL INTUSSUSCEPTION AND MECKEL'S DIVERTICULUM. *(Sp.)* Rollan Villamarin, V.; Garcia Aroca, J. (Hospital Nino Jesus, Madrid, Spain). *Acta Pediatr. Esp.* 33(388):117-124, 1975.

8727 STUDIES ON THE PATHOGENESIS OF DIARRHEA FOLLOWING SMALL BOWEL BYPASS FOR MASSIVE OBESITY [abstract]. *(Eng.)* Stein, T.; Wise, L. (Washington Univ. Sch. Med., St. Louis, Mo.). *Clin. Res.* 23(3):257A, 1975.

8728 PATHOGENESIS OF ARTHRITIS ASSOCIATED WITH INTESTINAL BYPASS PROCEDURE FOR MORBID OBESITY: COMPLEMENT ACTIVATION AND CHARACTERIZATION OF CIRCULATING IMMUNE COMPLEXES [abstract]. *(Eng.)* Wands, J. R.; LaMont, J. T.; Mann, E.; Isselbacher, K. J. (Massachusetts Gen. Hosp., Boston, Mass.). *Clin. Res.* 23(3):259A, 1975.

8729 INTESTINAL INTUSSUSCEPTION IN CHILDHOOD RESULTING FROM HODGKIN'S DISEASE LOCALIZED IN THE ABDOMEN. *(Sp.)* Castillo Bernabeu, R.; Bocanegra Carranza, A. (Hopital Nino Jesus, Madrid, Spain). *Acta Pediatr. Esp.* 33(388):131-134, 1975.

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8732 FAILURE OF SECRETION AND CHOLECYSTOKININ (CCK) TO ALTER ILEAL HYPERPLASMA AFTER JEJUNECTOMY IN THE RAT [abstract]. *(Eng.)* Custer, G.; Tawil, T.; Weser, E. (Univ. Texas Health Sci Cent., San Antonio, Tex.). *Clin. Res.* 23(3):248A, 1975.

8733 MECKEL'S DIVERTICULUM. *(Dan.)* Fenger, C.; Bone, J. (Arhus Kommune Hospital, Denmark). *Ugeskr. Laeger* 137(2):82-85, 1975.

8734 STUDIES OF HUMAN FOLATE CONJUGASE [abstract]. *(Eng.)* Halsted, C. H.; Reisenauer, A. M.; Corcino, J. J. (Dept. Med., Univ. California, Davis, Calif.). *Clin. Res.* 23(3):250A, 1975.

8735 INTESTINAL ABSORPTION AND METABOLISM OF D-MANNITOL-U-^{14}C(M-^{14}C) [abstract]. *(Eng.)* Biork, J. T.; Soercel, K. H.; Wood, C. M. (Med. Coll. of Wisconsin, Milwaukee, Wis.). *Clin. Res.* 23(3): 391A, 1975.

8736 COLONIC PSEUDO OBSTRUCTION: A NEW COMPLICATION OF JEJUNOILEAL BYPASS [abstract]. *(Eng.)* Barry, R. E.; Benfield, J. R.; Bray, G. A. (Harbor Gen. Hosp., Torrance, Calif.). *Clin. Res.* 23(3):391A, 1975.

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8738 THE TREATMENT OF EXTERNAL POSTOPERATIVE FISTULAS OF THE SMALL INTESTINE. *(Fr.)* Francillon, J.; Pasquier, P.; Tissot, E.; Baudet, B.; Vignal, J. (Hopital Edouard-Herriot, 69374 Lyon Cedex 2, France). *Lyon Chir.* 71(4):221-224, 1975.

8739 THREE CASES OF INTESTINAL BEHCET AT TERMINAL ILEUM. *(Jpn.)* Sarashina, H.; Higuchi, M.; Yamazaki, T.; Majima, Y.; Furuyama, N.; Kitsukawa, Y.; Chikenji, Y.; Okui, K.; Kariya, A.; Nagao, K. (Med. Sch., Chiba Univ., Japan). *Rinsho Hoshansen* 20(3):255-261, 1975.

See also, 8017, 8055, 8103, 8433, 8442, 8449, 8488, 8499, 8537, 8549, 8557, 8561, 8589, 8593, 8600, 8606, 8612, 8619, 8740, 8741, 8742, 8749, 8750, 8762, 8778, 8781, 8787, 8800, 8835, 8839, 8848, 8851, 8852, 8859, 8972, 9008, 9012, 9252, 9266, 9269, 9309, 9315, 9319, 9330, 9334, 9345, 9359, 9383, 9397, 9406.

SMALL INTESTINE

Malabsorption

8740 CARNOSINASE ACTIVITY OF HUMAN GASTROINTESTINAL MUCOSA. *(E.)* Sadikali, F.; Darwish, R.; Watson, W. C. (Victoria Hosp., London, Ontario, Canada). *Gut* 16(8):585-589, 1975.

Carnosinase was assayed in endoscopically normal gastric, duodenal, and colonic mucosa from patients with symptoms not related to small intestine function; in jejunal mucosa from patients being investigated for a variety of gastrointestinal disorders (mainly diarrhea or malabsorption); and in the rat jejunal mucosa. The role of this dipeptidase in the absorption of L-carnosine was investigated by comparing tolerance curves for carnosine (β-alanine L-histidine) and its constituent amino acids in 2 patients, one of whom had a markedly reduced activity of jejunal carnosinase. The hydrolysis of carnosine followed the kinetics of a zero order reaction and the rate was proportional to the volume of homogenate in the reaction mixture. The optimum pH was around 8.0. Carnosinase activity was increased about 70% by adding 0.001 M Mn^{++} and was completely inhibited by 0.001 M cyanide. Carnosinase activity in the rat jejunal mucosa was somewhat lower than that in the human jejunum. Little or no enzyme activity was detected in the human gastric and colonic biopsies, and the activity in the human duodenum was considerably lower than in the jejunum. The mean carnosinase activity was 8.8 U in patients with histologically normal jejunal mucosa and 5.7 U in those with partial or subtotal villous atrophy; in the latter patients, the enzyme deficiency was nonspecific and secondary to the villous atrophy. In the second experiment, the rise in serum β-alanine at 30 min and the rise in serum histidine at 30 and 45 min were greater with the mixture of free amino acids than with carnosine in the patient with normal jejunal carnosinase activity. Absorption of both amino acids at 30 and 45 min was somewhat slower in the patient with reduced jejunal carnosinase, but histidine absorption was faster with carnosine than with the free amino acids in this patient. It is concluded that the intestinal mucosa has much less hydrolase activity for carnosine than for glycylglycine and other dipeptidases, and the relatively slow hydrolysis appears to be the rate-limiting step in the total absorptive process.

8741 THE CELLULAR INFILTRATE OF THE JEJUNUM IN ADULT COELIAC DISEASE AND DERMATITIS HERPETIFORMIS FOLLOWING THE REINTRODUCTION OF DIETARY GLUTEN.

(E.) Lancaster-Smith, M.; Kumar, P. J.; Dawson, A. M. (St. Bartholomew's Hosp., London, England). *Gut* 16(9):683-688, 1975.

The cellular infiltrate of the jejunal mucosa in treated and untreated dermatitis herpetiformis was studied. Jejunal biopsies were obtained from eight control subjects, patients (12) with untreated and treated (using a gluten-free diet, 11 patients) adult celiac disease, and patients (8) with untreated and treated (using a gluten-free diet, 9 patients) dermatitis herpetiformis. In addition, serial jejunal biopsies were obtained from 12 adult celiac disease patients and 12 dermatitis herpetiformis patients while on gluten-free and gluten-containing (10-60 g/day) diets and after a single 25-g gluten challenge. The number of plasma cells in the jejunal biopsy specimens was similar in the patients with adult celiac disease and dermatitis herpetiformis. Compared with the untreated patients, the plasma cell number was reduced in the treated patients; however, the number of plasma cells was significantly greater in both treated and untreated patients than in the controls. The plasma cell counts increased after seven days on a gluten-containing diet compared with pregluten levels and also increased 24 to 48 hr after a single 25-g gluten challenge. The lamina propria lymphocyte count was similar in treated and untreated patients with both diseases and was not significantly different from control values. Although there was no change after seven days on a gluten-containing diet, the number of cells increased significantly, while remaining within normal values after a single 25-g gluten challenge. The number of eosinophils was significantly greater in the untreated patients than in the treated patients or controls; the number in the treated patients and controls was similar. The number of eosinophils increased after a seven-day gluten-containing diet and after a single gluten challenge. Neutrophils were found in small number and only in the diseased patients; their number tended to be greatest in the untreated patients following gluten challenge. The number of intraepithelial lymphocytes was significantly greater in the untreated patients than in the treated patients and was significantly greater in the treated patients than in the controls. The number increased after seven days on a gluten-containing diet and after a single gluten challenge. The results support the view that more than one immunological mechanism may be responsible for the pathogenesis of the jejunal lesion in celiac disease and dermatitis herpetiformis.

8742 ADAPTIVE CHANGES IN VITAMIN B_{12} ABSORPTION IN CELIAC DISEASE AND AFTER PROXIMAL SMALL-BOWEL RESECTION IN MAN.

(E.) Mackinnon, A. M.; Short, M. D.; Elias, E.; Dowling, R. H. (Royal Postgraduate Medical Sch., Hammersmith Hosp., Ducane Rd., London, England). *Am. J. Dig. Dis.* 20(9):835-840, 1975.

To study possible adaptive changes in ileal vitamin B_{12} absorption following jejunectomy in man, intrinsic-factor-bound vitamin B_{12} ($IF-B_{12}$) absorption was compared in four patients in whom the proximal small intestine had been resected and in nine patients with adult celiac disease. Twenty-four healthy adults served as controls. The subjects were given a 5-μg dose of ^{58}Co cyanocobalamin and two capsules of human intrinsic factor; ten min and seven days later, vitamin B_{12} absorption was measured by a whole body counting technique with an uncollimated gamma camera. In the control subjects, the mean value for the whole body retention of ^{58}Co cyanocobalamin (at seven days) was 20.4% of the administered dose. In the four patients with extensive jejunal resection, vitamin B_{12} absorption (mean, 42.3%) was significantly greater than in the control subjects. In one patient studied before and after resection, vitamin B_{12} absorption increased more than 150% five months after jejunectomy. The vitamin B_{12} retention values were within normal limits in seven of the nine celiac disease patients; the remaining two cases had retention values of 44.1% and 54.0% of the administered dose, resp. The results suggest that functional ileal adaptation occurs in man after jejunal resection; the pattern of adaptation is similar to that observed in experimental animals.

8743 RETICULIN ANTIBODIES IN PATIENTS WITH COELIAC DISEASE AND THEIR RELATIVES.

(E.) Stevens, F. M.; Lloyd, R.; Egan-Mitchell, B.; Mylotte, M. J.; Fottrell, P. F.; Wright, R.; McNicholl, B.; McCarthy, C. F. (Dept. Gastroenterology, Univ. Coll., Galway, Ireland). *Gut* 16(8): 598-602, 1975.

The incidence of the reticulin antibody in the sera of patients with celiac disease and in the sera of members of their family was investigated. In addition, the relation of treatment to reticulin status in adults and children with celiac disease was analyzed. The sera of 83 celiac patients, 121 first-degree relatives, and 104 controls (63 biopsied symptomatic controls and 41 random control sera) were screened for the presence of reticulin antibodies. Among the untreated celiac patients, 75% of the adults and 93% of the children had reticulin antibody in their sera. No antibody was detected in any of the 30 treated celiac patients. All of the celiac disease patients showed clinical improvement on a gluten-free diet and repeat biopsies in 53 showed morphological and enzymatic improvement. The presence of reticulin antibody was unrelated to sex, blood group, fecal fats, serum iron, or mucosal lymphocyte count, but the serum IgG levels were significantly higher in the untreated adult celiac patients (mean, 1364 mg%) with reticulin antibodies than in similar patients with no antibodies (mean, 1085 mg%). Of the first-degree relatives, 21 were reticulin antibody positive; of the 17 in this group who were biopsied, 12 were found to have celiac disease. Biopsies in 65 first-degree relatives without reticulin antibody demonstrated celiac disease in two cases. Of the 68 relatives and 63 symptomatic controls with normal biopsies, five of the relatives and four of the controls were reticulin antibody positive. In two families with more than three celiac siblings, all affected children were reticulin antibody positive, none of the parents were positive, and there were no false positives among the normal children. Reticulin antibody thus appears to be a more sensitive indicator of gluten-sensitive enteropathy than any other screening procedure.

8744 ISOLATION AND CHARACTERIZATION OF AN AETIOLOGICAL AGENT IN WHIPPLE'S DISEASE.

(E.) Clancy, R. L.; Tomkins, W. A. F.; Muckle, T. J.; Richardson, H.; Rawls, W. E. (Dept. Medicine, McMaster Univ., Hamilton, Ontario, Canada). *Br. Med. J.* 3(5983):568-570, 1975.

The isolation and characterization of a cell wall deficiency bacterium which appears to be an etiological agent in Whipple's disease is reported. The bacterium was isolated from a prolonged lymph node culture established from tissue from a 40-yr-old woman with Whipple's disease. Primary cultures of blood, jejunal aspirate, bone marrow, and lymph node yielded no growth in normal or hypertonic culture media. However, whereas culture of a jejunal biopsy specimen yielded no growth in normal media, a cell wall-deficient bacterium grew out in hypertonic media. The morphology, staining, and growth characteristics were identical to those of the organism grown in the lymph node culture. The organism was a Gram-positive coccus identified as *Streptococcus dysgalactiae*. Monolayer cells taken from the lymph node culture at the time the bacterium was isolated were distended with diastase-resistant/PAS-positive material, and inoculation of the lymph node culture onto monolayers of human colon fibroblasts induced the accumulation of diastase-resistant/PAS-positive material within the cultured cells. When the organism was inoculated only to monolayers of human fibroblasts, it grew within the cells and stained positive with diastase-resistant/PAS. The organism was sensitive to tetracycline *in vitro*. The patient's serum contained antibody against the material within Whipple's disease macrophages and absorption of the patient's serum with the isolated organisms completely removed antibody activity. The data suggest that a pathogenic bacterium is the essential etiological agent in Whipple's disease and that the culture of Whipple's disease tissues in hypertonic media may have practical value.

8745 TREATMENT OF WHIPPLE'S DISEASE WITH SULPHAMETHOXAZOLE-TRIMETHOPRIM. *(E.)*

Elsborg, L.; Gravgaard, E.; Jacobsen, N. O. (Arhus Amtssygehus, Arhus, Denmark). *Acta Med. Scand.* 198(1/2):141-143, 1975.

The case report of a 45-yr-old man with Whipple's disease who responded rapidly to sulfamethoxazole-trimethoprim therapy was presented. Jejunal biopsy revealed enlarged coarse villi and lamina propria densely infiltrated with periodic acid-Schiff (PAS)-positive macrophages. Serum cobalamines and serum folates were low. Bone marrow aspiration demonstrated megaloblastic dysplasia and blood smears showed leukocytosis. Severe malabsorption was confirmed by abnormal findings in the Schilling test, folic acid absorption, D-xylose absorption, and glucose absorption tests, and by increased fecal lipid excretion. Therapy was instituted; the patient received two tablets twice a day, each tablet containing 400 mg sulfamethoxazole and 80 mg trimethoprim. After two months of treatment, the bone marrow, serum cobalamines and serum folates were normal, and jejunal biopsies showed less extensive infiltration of PAS-positive cells. At six months, there was no indication of malabsorption or steatorrhea, and hematological values were normal. Treatment was discontinued at 12 months, at which time the jejunal mucosa was almost normal; the villi were slender and only a small number of faintly PAS-positive cells were present in the lamina propria. The patient remained well three months after the discontinuation of treatment. These results suggest that sulfonamide combined with trimethoprim may be the drug of first choice in the treatment of Whipple's disease.

8746 RECURRENT APHTHOUS ULCERATION AND ITS ASSOCIATION WITH COELIAC DISEASE [abstract].

(E.) Ferguson, R.; Basu, M. J.; Asquith, P.; Cooke, W. T. (Gen. Hosp., Birmingham, England). *Gut* 16(5): 393, 1975.

8747 DEPLETION OF THYMUS-DEPENDENT LYMPHOCYTES IN ADULT COELIAC DISEASE [abstract]. *(E.)* O'Donoghue, D. P.; Lancaster-Smith, M.; Kumar, P. J. (St. Bartholomew's Hosp., London, England). *Gut* 16 (5):392-393, 1975.

8748 USE OF AN IMPROVED JEJUNAL CULTURE SYSTEM FOR THE STUDY OF NORMAL AND COELIAC MUCOSA [abstract]. *(E.)* L'Hirondel, C.; Doe, W. F.; Peters, T. J. (R. Postgrad. Med. Sch., London, England). *Gut* 16(5):392, 1975.

8749 ADAPTIONS OF INTESTINAL STRUCTURE FOLLOWING JEJUNOILEAL BYPASS FOR MASSIVE OBESITY [abstract]. *(E.)* Owen, R. L. (VA Hosp., San Francisco, Calif.). *Gastroenterology* 68(4):1083, 1975.

8750 AN EXPLANATION FOR THE PRESENCE OR ABSENCE OF HYPEROXALURIA IN PATIENTS WITH JEJUNOILEAL BYPASS [abstract]. *(E.)* Earnest, D. L.; Williams, H. E.; Admirand, W. H. (San Francisco Gen. Hosp., San Francisco, Calif.). *Gastroenterology* 68 (4):1072, 1975.

8751 THE EFFECT OF AGE ON INTESTINAL ABSORPTION [abstract]. *(E.)* McKnight, W. D.; Smart, D. F.; Texter, Jr., E. C. (VA Hosp., Little Rock., Ark.). *Gastroenterology* 68(4):1059, 1975.

8752 ENTERIC LOSS OF LYMPHOCYTES IN CELIAC DISEASE AND IN CROHN'S DISEASE [abstract]. *(E.)* Douglas, A. P.; Westman, A. P.; Haggith, J. (Med. Sch., Newcastle upon Tyne, England). *Gastroenterology* 68(4):1056, 1975.

8753 INTRACTABLE SPRUE SUCCESSFULLY TREATED BY TOTAL PARENTERAL ALIMENTATION (TPA) FOLLOWED BY SELECTIVE PROTEIN-RESTRICTED DIET [abstract]. *(E.)* Baker, A.; Wagonfeld, J. B.; Rosenberg, I. H. (Dept. Med., Univ. Chicago, Ill.). *Gastroenterology* 68(4):1054, 1975.

8754 ABSORPTIVE AND DIGESTIVE FUNCTION IN PERNICIOUS ANEMIA [abstract]. *(E.)* Lyford, C. L.; Folscroft, J.; Arvanitakis, C. (Kansas Univ. Sch. Med., Kansas City, Kans.). *Gastroenterology* 68(4): 1053, 1975.

8755 THE ENDOSCOPIC APPEARANCE OF THE DUODENUM IN WHIPPLE'S DISEASE [abstract]. *(E.)* Salyer, W. R.; Milligan, F. D.; Bayless, T. M.; Yardley, J. H. (Johns Hopkins Univ. Sch. Med., Baltimore, Md.). *Gastroenterology* 68(4):1048, 1975.

8756 DISTURBANCES OF INTESTINAL ABSORPTION DURING AGAMMAGLOBULINAEMIA. *(Pol.)* Zalewski, T.; Gutkowska, J.; Kapuscinska, A. (Z III Kliniki Ogolnopediatrycznej Inst. Pediatrii, Warsaw, Poland). *Pediatr. Pol.* 50(5):597-606, 1975.

8757 ENTEROTOXIGENIC INTESTINAL BACTERIA IN TROPICAL SPRUE. IV. EFFECT OF Klebsiella pneumoniae ENTEROTOXIN ON INTESTINAL TRANSPORT IN THE RAT [abstract]. *(E.)* Klipstein, F. A.; Horowitz, I. R.; Engert, R. F. (Univ. Rochester Sch. Med., Rochester, N.Y.). *Gastroenterology* 68(4):927, 1975.

8758 SIGNIFICANCE OF THE SCHILLING TEST (ABSORPTION OF MARKED VITAMIN B_{12}) IN DIGESTIVE PATHOLOGY. *(Fr.)* Bernier, M. J. J. (Hosp. Sainte-Lazare, Paris, France). *Bordeaux Med.* 8(6):639-643, 1975.

8759 SPECIFIC VITAMIN B_{12} MALABSORPTION (IMERSLUND'S DISEASE) AND ITS TREATMENT. *(Fr.)* Odievre, M.; Pigot, J. Y. (no affiliation given). *Arch. Fr. Pediatr.* 32(2):185-189, 1975.

8760 A PHYSICOCHEMICAL BASIS FOR TREATMENT OF ENTERIC HYPEROXALURIA [abstract]. *(Eng.)* Earnest, D. L.; Williams, H. E.; Admirand, W. H. (San Francisco Gen. Hosp., San Francisco, Calif.). *Clin. Res.* 23(3)439A, 1975.

8761 EXPERIMENTAL OSMOTIC DIARRHEA: CARBOHYDRATE INTAKE EFFECTS ON INTESTINAL DISACCHARIDASES [abstract]. *(Eng.)* Pergolizzi, R.; Lifshitz, F.; Teichberg, S.; Wapnir, R. A. (North Shore Univ. Hosp., Manhasset, N. Y.). *Fed. Proc.* 34(3):900, 1975.

8762 RETICULUM CELL SARCOMA AS A COMPLICATION OF SPRUE. *(Ger.)* Schulz, H. J.; Witter, H.; Martin, H.; Reitzig, P.; Dietze, F.; Lisewski, G. (Bereich Medizin [Charite], Humboldt-Universitat, Berlin, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 35(2):81-90, 1975.

8763 THE INCIDENCE OF ABSORPTION IN SMALL CHILDREN: AN EPIDEMIOLOGICAL STUDY. *(Ger.)* Wedekind, U.; Konig, K.; Fiehring, C. (Medizinische Akademie, Erfurt, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 35(2):66-70, 1975.

8764 SMALL-INTESTINAL HISTOLOGY IN COELIAC DISEASE. *(Eng.)* Walker Smith, J.; Kilby, A. (Queen Elizabeth Hosp. Children, London, E28PS England). *Lancet* 2(7925):132, 1975.

8765 VIRUS-LIKE PARTICLES IN JEJUNAL MUCOSA. *(Eng.)* Tomkins, A. N.; Wright, S. G.; Bird, R. G.; James, W. P. T. (London Sch. Hygiene Tropical Medicine, London, NW1 2PE, England). *Lancet* 2(7923):36-37, 1975.

8766 PROTEIN-LOSING ENTEROPATHY ASSOCIATED WITH CHRONIC PERICARDITIS WITH EFFUSION. *(Fr.)* Losay, J. (Hopital Enfants, F 94270 Bicetre, France). *Arch. Fr. Pediatr.* 32(6):285-290, 1975.

8767 SCLEROSIS OF THE INTESTINAL LYMPHATICS. *(Fr.)* Servelle, M.; Turiaf, J.; Albeaux-Fernet, M.; Laroche, C.; Bernier, J. J.; Soulie, J.; Bacourt, F.; Chabot, J.; Fournier, D.; Andrieux, J. B. (Hopital Saint-Michel, 33, rue Olivier Serres, 75015 Paris, France). *Sem. Hop. Paris* 51(12)799-806, 1975.

8768 RADIOLOGICAL EXAMINATION IN THE LACTASE DEFICIENCY SYNDROME. *(It.)* Bartoli, E.; Nerli, A.; Giudici, G. (Istituto di Radiologia, Universita, 67 via Roma - I-56100 Pisa, Italy). *Radiol. Med.* 61(1):1-11, 1975.

8769 BACTERIAL CULTURE OF JEJUNAL MUCOSA IN CHILDHOOD CELIAC DISEASE. *(Eng.)* Evans, N.; Brueton, M. J.; Turner, P. J.; McNeish, A. S. (Univ. Birmingham, Inst. Child Health, Francis Rd., Birmingham B16 8ET, England). *Lancet* 2(7923):435-36, 1975.

8770 SYMPTOM RESPONSE TO LACTOSE REDUCED MILK IN LACTOSE INTOLERANT ADULTS. *(Eng.)* Jones, D. V.; Latham, M. C.; Kosikowski, F. V.; Woodward, G. (Division of Nutritional Sciences, Cornell Univ., Ithaca, N. Y.). *Fed. Proc.* 34(3):930, 1975.

8771 LACTOSE TOLERANCE IN MEXICAN AMERICAN CHILDREN [abstract]. *(Eng.)* Woteki, C. E.; Weser, E.; Young, E. A. (Univ. Texas Health Sci. Cent., San Antonio, Tex.). *Clin. Res.* 23(3):462A, 1975.

8772 STUDIES OF CALCIUM METABOLISM IN LACTASE DEFICIENCY IN MAN [abstract]. *(Eng.)* Spencer, H.; Kramer, L.; Norris, C. (VA Hosp., Hines, Ill.). *Clin. Res.* 23(3):462A, 1975.

8773 ENTEROTOXIGENIC INTESTINAL BACTERIA IN TROPICAL SPRUE. III. PRELIMINARY CHARACTERIZATION OF Klebsiella pneumoniae ENTEROTOXIN [abstract]. *(Eng.)* Klipstein, F. A.; Engert, R. F. (Univ. Rochester Sch. Med., Rochester, N. Y.). *Clin. Res.* 23(3):252A, 1975.

8774 THE INCIDENCE AND APPEARANCE OF METABOLIC BONE DISEASE IN NON TROPICAL SPRUE [abstract]. *(Eng.)* French, A. B.; Garn, S. M.; Poznanski, A. K. (Dept. Int. Med., Univ. Michigan, Ann Arbor, Mich.). *Clin. Res.* 23(3):549A, 1975.

8775 JEJUNAL HYDROLYSIS AND UPTAKE OF CONJUGATED FOLATE IN TROPICAL SPRUE [abstract]. *(Eng.)* Halsted, C. H.; Reisenauer, A. M.; Coreino, J. J. (Dept. Med., Univ. California, Davis, Calif.). *Clin. Res.* 23(3):457A, 1975.

8776 WHIPPLE'S DISEASE. *(Ger.)* Franken, F. H.; Boenigk, U.; Schmitt, H.; Falck, J. (Innere Abteilung, Krankenhauses St. Josef, Wuppental-Elberfeld, Germany). *Dtsch. Med. Wochenschr.* 100(25): 1390-1392, 1975.

8777 INTESTINAL LIPODYSTROPHY (WHIPPLE'S DISEASE): A RARE CAUSE OF SPRUE SYNDROME. *(Ger.)* Zabaidi, G. (Klinik Innere Medizin, Univ., 25 Rostock, Ernst-Heydemann Strasse, Germany). *Z. Gesamte Inn. Med.* 30(13):454-457, 1975.

8778 THE CAUSES OF CHOLEREIC ENTEROPATHY. *(Ger.)* Ewe, K. (I. Medizinische Klinik Poliklinik, Universitat, 65 Mainz, Langenbeckstr. 1, Germany). *Dtsch. Med. Wochenschr.* 100(32):1639-1640, 1975.

8779 DERMATITIS HERPETIFORMIS AND CELIAC DISEASE. *(Fr.)* Rousseau, B. (Centre hospitalier, Universite Laval, 2705, boul Laurier, Ste-Foy, Quebec, Canada). *Union Med. Can.* 104(9):1365-1368, 1975.

8780 IMMUNOGLOBULIN A DEFICIENCY IN SPRUE. *(Rus.)* Gurnicki, B.; Krupinska-Sanecka, I. (Inst. Pediatrics, Warsaw, Poland). *Vopr. Okhr. Materin. Det.* 20(6):40-41, 1975.

See also, 8412, 8413, 8429, 8453, 8537, 8690, 8691, 8693, 8697, 8700, 8734, 8854, 8977, 9334, 9388.

LARGE INTESTINE

8781 HYPOTONIC COLON EXAMINATION WITH GLUCAGON. *(E.)* Miller, R. E.; Chernish, S. M.; Skucas, J.; Rosenak, B. D.; Rodda, B. E. (Indiana Univ. Sch. Medicine, Indianapolis, Ind.). *Radiology* 113(3):555-562, 1974.

The influence of exogenous glucagon, atropine sulfate, and glucagon plus atropine sulfate on the barium enema examination was reported. Twelve male asymptomatic volunteers, aged 20-45 yr, participated in the double-blind crossover study. Drug doses evaluated were: 2 mg glucagon, 1 mg atropine sulfate, and 1 mg atropine sulfate plus 2 mg glucagon; the glucagon-diluting solution acted as a placebo. Each dose consisted of two i.m. injections and each subject received all four drugs. Patients were asked to rate any discomfort after injection, when the barium reached the colon, and when the barium flow ceased. Radiologic examination included: extent of reflux, ease of examination, and rate of small intestine filling. The amount of time needed to reach cecum and fill small intestine were recorded. The width of the sigmoid, descending, transverse, ascending colon, cecum, and ileum along with length of small intestine were measured. There was little treatment effect except for a reduction in width of transverse colon (5.2 to 2.7 cm) and a decrease in width of terminal ileum (2.2 to 1.8 cm) after atropine sulfate treatment. The length of the ileum and the width of ceca increased after glucagon. Atropine sulfate increased the pulse rate from 78 to 92 after one hr whereas glucagon had no effect on pulse rate. Glucagon best facilitated the barium examination and produced the least number of negative side effects. The combination of glucagon plus atropine sulfate produced the most side effects. Marked discomfort was noted only with spasms. Glucagon relaxed the colon and was suggested for use in patients with motility problems.

8782 FUNCTION OF THE ANAL SPHINCTERS IN SPINAL MAN. *(E.)* Frenckner, B. (Serafimer Hosp., Stockholm, Sweden). *Gut* 16(8):638-644, 1975.

Eight male patients (mean age, 35 yr) with traumatic transverse lesions of the spinal cord and eight healthy controls were examined with respect to the function of the anal sphincters. Continuous recordings of anal pressure and electromyograms (EMG) from the striated sphincter muscles were obtained during gradual rectal distension by means of an air-filled balloon. The corrected rectal pressures at various volumes of the rectum were similar for patients and controls. Both groups showed continuous tonic EMG activity of the external sphincter and the puborectalis muscle; the anal reflex was positive in all cases. Inflation reflexes of the striated muscles were recorded in six patients and in all controls when the rectum was expanded. The rectal volumes at which the first inflation reflex occurred were significantly higher among the patients. Upon further distension of the rectum, the electrical activity of the striated muscles gradually decreased and ultimately ceased in seven patients compared with only one of the controls. In the remaining patient and controls, the electrical activity was unchanged or increased as long as the rectal filling proceeded. The rectal volumes at which electrical activity was lost were significantly smaller among the patients. The patients showed a normal anal pressure at rest and a more pronounced relaxation and constant relaxation of anal pressure upon distension of the rectum. It is concluded that upon rectal distension in normal man, the striated muscles are stimulated by a cerebral center at a subconscious level as well as by a low center of the spinal cord. The former accounts for an augmented inflation reflex and maintained or increased electrical activity when rectal distension is substantial. In contrast, the smooth internal sphincter is independent of cerebral influence at rest as well as during rectal distension.

8783 POSTOPERATIVE MOTILITY OF THE LARGE INTESTINE IN MAN. *(E.)* Wilson, J. P. (Queen Mary's Hosp., Sidcup, Kent, England). *Gut* 16(9):689-692, 1975.

Motor activity of the colon in the immediate postoperative period was studied in 36 patients using radiotelemetering capsules, radioopaque markers, and serial abdominal radiographs. Of the 36 patients, 16 had gastrointestinal tract operations, eight had intraperitoneal operations, four had retropubic prostatectomies, and eight had nonabdominal operations. The variables recorded were the return of segmental pressure activity, the first passage of flatus, the passage of 80% of the markers in stools, and the time at which colonic distension decreased on radiographs. Return of segmenting pressures and passage of flatus were delayed in all cases, but more significantly where an abdominal incision was made. Colonic pressure activity returned about 16 hr after nonabdominal operations, whereas activity was not recorded until 40 to 48 hr after abdominal operations. The first passage of flatus occurred 16 hr after nonabdominal operations compared with a delay of 68 and 110 hr after gastrectomy and colectomy, resp. Neither the length of the operation nor the amount of postoperative analgesia (Omnopon) had any significant effect on the duration of colonic ileus. Gaseous distension after laparotomy was confined to the colon. It is suggested that wind pains after abdominal surgery coincide with the return of colonic motility, and probably represent attempts at contraction by an already distended colon.

8784 COLONIC MOTILITY IN MAN. *(E.)* Duthie, H. L. (Sheffield Royal Infirmary, England). *Mayo Clin. Proc.* 50(9):519-522, 1975.

The difference in electrical patterns in intestinal motility between the rectum and colon in man was investigated. Myoelectrical activity was studied in 150 subjects using suction, implanted and cutaneous electrodes. Electrical records were submitted for computer analysis to give measurements of the frequency of slow wave activity and to establish the time duration of regular wave activity. Motility was assessed as a percentage of the recorded time when motor waves were present. Two rhythms of slow wave were found; a slower one at 2.5 to 4.0 cycles/min and a faster one at 6.0 to 12.0 cycles/min. Pentagastrin, at 6 μg/kg/hr, i.v., affected only the slower rhythm and neostigmine (0.5 mg, i.m.) affected only the faster frequency rhythm. Two gradients appeared in the colon; one was based on a faster frequency of slow waves and the other on the percentage and incidence of regular slow wave activity. In the colon, unlike the small intestine, the percentage of time occupied by regular slow waves was greatest on the right side and decreased through the descending and sigmoid colon and rectum with a sharp increase in the lowest rectum. The two factors that may be responsible for the delay in transit in the rectum are: that the proportion of the faster frequency rhythms of slow waves is greater and is associated with a higher proportion of motor activity; and that there is a similar preponderance of the faster frequency of slow waves and motor activity in the lower rectum. Theoretically, it is possible to use a chain of relaxation oscillators to produce the two frequencies of slow waves in each area of the colon with periods of no wave activity.

8785 EFFECT OF LACTULOSE ON RABBITS FED ON A LOW RESIDUE DIET. *(E.)* Hodgson, J. (St. George's Hosp., Merton Pk., London, England SW17 0QT). *Am. J. Gastroenterol.* 64(2):115-121, 1975.

The effect of lactulose (4-O-β-galactopyranosyl-D-fructose; 2 ml/kg/day administered through an orogastric tube for 4 mo) was tested on six New Zealand rabbits maintained on a low residue diet representative of the diet ingested by older persons in Western countries. The diet consisted of white bread, butter, milk and sugar supplemented by complan, a nutritive powder preparation. Wet fecal weight, fecal pH, and transit times were measured daily in these rabbits and in six control rabbits given only the low-residue diet. Intracolonic pressure measurements were obtained at the beginning and the end of the experiment. The controls developed a very low fecal output, with mean monthly values of fecal weight varying between 2 and 4.6 g, increased transit times of 48 hr, and intracolonic pressures that increased over four months from a colonic motility index (CMI) of 12,261 to a CMI of 28,084 in response to neostigmine (0.05 mg/kg). The rabbits given lactulose did not develop diarrhea but produced three times the wet fecal weight of the rabbits on the diet alone, with mean values ranging from 9.4 to 12.4 g. Transit times remained at 24 hr (a normal transit time for rabbits on a regular laboratory diet), and intracolonic pressures rose only from a CMI of 11,652 to a CMI of 14,263 at the end of four months. Longitudinal sections from rabbit colon after four months on the low-residue diet showed thinning of the apex of the haustrum and thickening of the interhaustral fold. These changes were less marked in the presence of lactulose. These results suggest that lactulose may help prevent symptoms of diverticular disease in elderly persons on a low-residue diet by increasing fecal bulk, decreasing transit times, and reducing segmental pressures.

8786 THE EFFECT OF PERITONEAL LAVAGE ON THE POSTOPERATIVE COURSE AFTER COLONIC ANASTOMOSIS AND PERFORATION IN THE RAT. *(E.)* Arnesjo, B.; Breland, U.; Petersson, B. G. (Univ. Hosp., Lund, Sweden). *Acta Chir. Scand.* 141(5):433-436, 1975.

The effects of peritoneal lavage on the postoperative course were evaluated in Wistar rats subjected either to transection and re-anastomosis of the descending colon (20 rats) or to perforation of the descending colon (10 rats) or cecum (10 rats). Control rats underwent the same operative procedures but did not receive peritoneal lavage. The parameters studied were the presence of abdominal adhesions, peritonitis, fluid in the abdomen, anastomosis leakage, mortality and survival time. Compared with controls, the rats treated with lavage after colonic anastomosis had markedly fewer and less serious adhesions when autopsied 11 or 60 days after surgery. No leakage of the anastomosis, peritonitis, or peritoneal fluid was found in rats who had undergone lavage. Untreated rats showed no sign of anastomosis insufficiency, but on the 11th postoperative day all but one had turbid fluid in the abdominal cavity and some had peritonitis. Four of ten rats not treated with peritoneal lavage after perforation of the descending colon died of severe peritonitis, whereas all ten treated rats survived. Peritonitis, adhesions, and fluid were found in the surviving untreated rats autopsied on day 11 but in none of the treated rats. Four of ten rats treated by lavage after perforation of the cecum died on the second to the fifth postoperative day. All animals not given lavage treatment died within 18 hr of the operation; thus, the development of adhesions could not be evaluated. Aspirated fluid from rats which died despite lavage treatment contained blood and pus for a longer period than that of the surviving rats. At autopsy these rats did not have the omental covering of the perforations unlike those alive after 11 days. In an additional group of ten rats, the catheter alone did not cause adhesions or peritonitis. These results confirm that peritoneal lavage does not cause impaired healing of colonic anastomoses or perforations.

8787 PERSISTENT HYPOTENSION AND INTESTINAL INFARCTION IN A PATIENT WITH PRIMARY AMYLOIDOSIS. *(Eng.)* Mallory, A.; Struthers, J. E., Jr.; Kern, F., Jr. (Univ. Colorado Medical Center, Denver, Colo.). *Gastroenterology* 68(6):1587-1592, 1975.

A case of primary amyloidosis in which the major symptoms were caused by vascular insufficiency of the intestine is reported. A 65-yr-old man was hospitalized with a history of shortness of breath, ankle edema, weight loss, anorexia, and watery, bloody diarrhea. His blood pressure was 85/60 with a pulse of 90/min. A chest X-ray showed mild osteoporosis; and EEG indicated low limb voltage and nonspecific ST-T wave changes; a bone marrow biopsy gave evidence of milk plasma cell hyperplasia and decreased iron; and sigmoidoscopy revealed that above 10 cm, the bowel mucosa was edematous and friable with ulcerations and large raised lesions. The gross and microscopic appearance of the sigmoid and rectum appeared to be due to ischemia. A transfemoral abdominal aortogram and selective superior mesenteric angiogram revealed a marked prolongation of opacification of the middle and left colic arteries and the small and large bowel. No veins were seen draining the small bowel or transverse colon. The patient abruptly developed severe diffuse abdominal pain, followed by bright red rectal bleeding and anuria. Abdominal examination showed only moderate, diffuse tenderness which later became severe with rebound. Vital signs were unchanged except for a heart rate of 120 per min. Laparotomy revealed a severely ischemic and questionably viable bowel with numerous small subserosal and submucosal hemorrhages and shallow mucosal ulcerations. The entire intestinal tract was friable. The patient died of cardiac arrest during surgery. At autopsy, the intestinal lesion was found to involve the lower 1/3 of the esophagus, as well as the stomach, ileum, and colon. Microscopic examination showed amyloid in the heart, liver, spleen, lungs, pancreas, kidneys, testes, and in the mucosa and submucosa of the intestinal tract. It is suggested that chronic hypotension resulting from the nephrotic syndrome led to decreased splanchnic perfusion, and that amyloid deposits within the intestinal blood vessel walls further impaired perfusion by impeding blood flow. Gastrointestinal bleeding caused further splanchnic vasoconstriction and more severe ischemia.

8788 ACUTE APPENDICITIS IN PREGNANCY. *(E.)* Rosemann, G. W. E. (Tygerberg Hosp., Parawvallei, CP). *S. Afr. Med. J.* 49(36):1459-1463, 1975.

The diagnosis and treatment of six cases of acute appendicitis during pregnancy were discussed. Two cases were misdiagnosed: a 30-yr-old woman (at 34 weeks of gestation) as having degeneration of a fibroid and a 34-yr-old woman (22 weeks of gestation) as having an obstruction of the right ureter. The initial incorrect diagnoses increased the danger from abscesses and infection. Alder's sign was present in four of six cases with painful ballottement. The inability to diagnose early was the most important cause of high morbidity during this condition. Diagnosis may be difficult because the early clinical signs of appendicitis are similar to those of pregnancy. Vague pain in right quadrant, nausea, and vomiting should not be ignored during pregnancy. A furred tongue and increasing tachycardia are the most constant clinical signs of appendicitis. Pyrexia, rebound tenderness, muscle guarding, and rigidity may be absent due to the stretching of the anterior abdominal muscles. If pain is constant, it is more likely to be of extra-uterine origin. The "heel-stamping" sign was another useful diagnostic tool. Leukocyte counts are unreliable unless done serially along with sedimentation rate. The prognosis of acute appendicitis in pregnancy is directly proportional to the duration of symptoms and early diagnosis. The dangers of negative laparotomy are minimal.

8789 APPENDICITIS AND MIMICKING CONDITIONS: A PROSPECTIVE STUDY. *(E.)* Gilmore, O. J. A.; Browett, J. P.; Griffin, P. H.; Ross, I. K.; Brodribb, A. J. M.; Cooke, T. J. C.; Higgs, M. J.; Williamson, R. C. N. (Royal Berkshire Hosp., Reading, England). *Lancet* 2(7932):421-424, 1975.

A prospective study of 444 consecutive patients, 228 male and 216 female, aged 0 to 50 yr, treated for appendicitis was carried out. The state of the appendix was classified as being one of the following: not inflamed, acutely inflamed, gangrenous, or perforated. At operation, a swab was taken from the outer appendix wall *in situ* for bacterial examination using gram film, blood agar and MacConkey plates. Accuracy of diagnosis was studied in relation to the state of appendix, the sex and age of the patient. Only 346 of 444 patients had acutely inflamed, gangrenous or perforated appendices. The overall diagnostic error was 22% and was higher in females than in males. Diagnostic error was highest in females between zero to ten yr (32%) and 11 to 20 yr (31%) with the lowest error for females aged 31 to 50 yr (15%). The highest diagnostic error for males occurred at age 11 to 20 (22%) with the lowest at age 21 to 30 yr (3%). Generally, acute appendicitis was suspected and proven most common in males during the first decade of life. A perforated appendix was found more frequently in younger and older patients with an overall incidence of 10%. The diagnostic accuracy for the 26 doctors, with full range of experience, varied from 54% to 95%. The most prominent conditions mimicking appendicitis were the following: non-specific mesenteric adenitis (12%), tubo-ovarian disorders, ovarian cysts, salpingitis, menstrual bleeding, fibroid uterus, and round-ligament strain associated with pregnancy. Gynecological disorders occurred more frequently in women over 30 yr of age. The incidence of bacterial isolation increased according to the severity of infection: acute infection, 18%, gangrenous, 38%, perforated, 82%. *Escherichia coli*, *Pseudomonas arugnosa*, bacteroides and *Streptococcus fecalis* were most common. Acute appendicitis is solely a clinical symptom. Care was urged in preventing unnecessary operations, particularly in women.

8790 PHYTOHEMAGGLUTININ-STIMULATED IMMUNE RESPONSE: ASSAY IN COLORECTAL CARCINOMA PATIENTS. *(E.)* Kaplan, M. S.; Mino, F. O.; Kummerfeld, K. B.; Lundak, R. L. (Dept. Surgery, Univ. California, 5901 E. Seventh St., Long Beach, Calif.). *Arch. Surg.* 110(10):1217-1220, 1975.

The response of lymphocytes from patients with colorectal cancer to phytohemagglutinin (PHA) stimulation in the presence or absence of control sera or tumor sera was investigated. The response was measured by tritiated thymidine incorporation. Eighteen colorectal cancer patients (aged 47-86 yr) and 18 controls without colorectal cancer (aged 39-61 yr) were studied. Eleven of the 18 cancer patients had metastatic type and seven had localized forms of carcinoma. Lymphocyte suspensions were prepared by the Ficoll-Hypaque gradient method. The activity of sera from cancer patients was investigated for its ability to inhibit PHA-induced DNA synthesis by lymphocytes. Cells were incubated for three days in 5% CO_2 and 95% air at 37 C and then pulsed with 1 μCi of tritiated thymidine; incorporation was measured by liquid scintillation. The mitotic indices (MI) of PHA-stimulated lymphocytes of control patients varied from 0.7 to 116 (mean, 29.2); the MI of PHA-stimulated cells from cancer patients varied from 2.0 to 60 (mean, 24.9). The MI values for cells from localized carcinoma varied from 4 to 52 (mean, 23.1) and metastatic cancer MI values ranged from 4 to 52 (mean, 26). Upon addition of autologous sera, the MIs for controls varied from 1 to 111 (mean, 39.6); for cancer patients the variation was 9 to 155 (mean, 48); for localized cancer, MI varied from 9 to 155 (mean, 48.4); and for metastatic cancer, MI ranged from 11 to 148 (mean, 47.7). With addition of sera from cancer patients, the MI varied from 1 to 206 (mean, 47.5), 2 to 104 (mean, 47.1), 2 to 88 (mean, 53.6), and 5 to 104 (mean, 43.8) for the controls and patients with colorectal, localized, and metastatic cancers, resp. The MI values from each incubation condition were not significantly different from controls. It is concluded that lymphocytes from patients with colorectal carcinoma were not inhibited in their response to PHA.

8791 COLONIC CARCINOMA: CLINICOPATHOLOGICAL CORRELATION WITH IMMUNOREACTIVITY. *(E.)*

Pihl, E.; Hughes, E. S. R.; Nind, A. P. P.; Nairn, R. C. (Monash Univ. Medical Sch., Alfred Hosp., Medbourne, Australia). *Br. Med. J.* 3(5986):742-743, 1975.

The relation between tumor spread, histological differentiation, and *in vitro* antitumor immunoreactivity was studied in 132 patients (67 men and 65 women, mean age 61 yr) with adenocarcinoma of the large intestine. Tumor spread was classified according to Kirklin's modification of Duke's classification. Seventy-nine tumors were confined to the wall of the colon and adjacent fat, and 53 had metastasized to the regional lymph nodes. The histologic differentiation was graded as good in 25 cases in which tumors formed glands similar to those of the normal mucosa and with little cellular atypia. In 33 cases in which the tumors formed only a few irregular glands with marked cellular atypia, the histological differentiation was graded as poor; and in 74 in which tumor differentiation was intermediate, it was graded as average. Blood lymphocyte antitumor cytotoxicity was significantly more common in patients with localized tumors (43%) than in those who already had metastases (17%). Peripheral blood lymphocyte antitumor cytotoxicity was also significantly more common in patients with well-differentiated tumors (64%) than in those with average or poorly differentiated tumors (25%). Only four of the 25 patients with well-differentiated tumors had lymph node metastases in contrast to 49 of 107 with tumors of poorer differentiation. Three of 34 surviving patients with cytotoxic lymphocytes had clinical signs of recurrence compared with 17 of 73 without such immunoreactivity. The positive correlations between lymphocyte antitumor cytotoxicity and histological differentiation, localized growth, and fewer recurrence suggest a better long-term prognosis.

792 PRIMARY LINITIS PLASTICA CARCINOMA OF THE COLON. *(E.)*

Raskin, M. M.; Viamonte, M.; Viamonte, M., Jr. (Mount Sinai Medical Center, Miami Beach, Fla.). *Radiology* 113(1):17-22, 1974.

Two case studies were reported of patients with primary linitis plastica carcinoma of the colon. Case I was a 34-yr-old female admitted with a three-month history of abdominal cramps and narrow, bloody stools. No previous weight loss was evident. Abdominal palpation and laboratory findings were normal. Sigmoidoscopy revealed a localized "cobblestone" appearance of the mucosa. Biopsy showed inflammation. A barium examination showed a 12 cm long stenotic lesion with mucosal ulceration at the rectosigmoidal junction. Laparotomy was performed and a 7 cm indurated area was removed. The lumen was narrowed due to a thickening of the wall to 7 mm. Pericolic fat contained round, firm 3 mm nodules. A microscopic examination of the lesion revealed a poorly differentiated mucinous carcinoma with infiltration of pericolic fat. The patient was readmitted after five months with another lesion in the same location and with bowel obstruction. This lesion was removed and showed a similar histologic appearance. Lymph nodes in both cases were free of tumor. The patient expired six months after the second operation; she had had continual bowel obstruction problems. Case II was a 71-yr-old male admitted with a two-month history of constipation. The abdomen was distended but no masses were palpated. A barium examination showed a stenotic lesion (4 cm) of the distal colon. An upper gastrointestinal series was normal. Six cm of colon was resected. The lumen was narrowed to 3.5 cm in circumference at the site of the lesion. The serosa underlying the lesion and the pericolic fat was retracted and firm. Microscopic examination showed a poorly differentiated carcinoma with numerous signet ring cells, and lymph and plasma cell infiltration. The patient was alive 16 months post-surgery. Generally, the clinical signs point to colitis and inflammation rather than to carcinoma. The lesions occur most often in the rectum and sigmoid colon. It is impossible to distinguish primary or secondary involvement if only one lesion is present. Diagnostic error and confusion with ulcerative colitis are frequent. The prognosis is often poor due to late diagnosis.

8793 THE CHANGING PATTERN OF HOSPITAL ADMISSIONS FOR DIVERTICULAR DISEASE OF THE COLON. *(E.)*

Kyle, J.; Davidson, A. I. (Royal Infirmary, Aberdeen, Scotland). *Br. J. Surg.* 62(7):537-541, 1975.

A retrospective study was made of all patients in northeastern Scotland admitted with colonic diverticular disease during two 4-yr periods. The presence of diverticula was confirmed by barium enema, by operation or at autopsy. Each patient also had at least two of the following clinical features: left-sided or lower abdominal pain; deep tenderness in the left iliac fossa; altered bowel habit; rectal bleeding; pyrexia over 37.5 C; and leukocytosis of 10^9/1, or more. During the first period (1958-1961), 206 patients were admitted with colonic diverticular disease, compared with 366 admitted in the second period (1968-1971). The age of the patients in the two periods; was similar, ranging from 35 to 89 yr in the first group and from 32 to 95 yr in the second. Excluding middle-aged males, the increases in cases admitted in the second period over those in the first group were statistically significant at the 5% level for each of the three 20-yr age goups (30-49, 50-69 and 70-89 yr of age). There were 74 men and 132 women admitted in the first period and 139 and 227, resp., admitted in the second period. This increase was proportionally greater for men than for women. The percentage of patients to be operated upon in the second period declined compared to the first. Colovesical fistula as a complication occurred in five patients in the first period and in four in the second period. The number of colonic perforations rose from 18 in the first period to 29 in the second, and the mortality rate for perforation also rose (from 28% to 39%). The overall mortality rate fell from 12.1% to 7.1%. It is suggested that the increase in admissions for this disorder has been partly due to a slight change in criteria for barium enema. It is concluded that the gradual aging of the population at risk is a major factor in the observed changes in admission rates for diverticular disease in northeastern Scotland.

8794 RECTAL DIVERTICULA.

(E.) Damron, J. R.; Lieber, A.; Simmons, T. (Univ. Kentucky Medical Center, Lexington, Ky. 40506). *Radiology* 115(2):599-601, 1975.

Etiological, clinical and radiological findings of eight patients with rectal diverticula were presented. The patients were identified in a collective study of rectal diverticula at two institutions from 1907 to 1973. The patients ranged from 54 to 84 yr of age (average age 73) and males predominated 3:1. The number of diverticula/patient ranged from one to three, with an average of two. In each patient, rectal diverticula coexisted with colonic diverticula, especially in the sigmoid segment, suggesting an etiological process common to both types. The rectal diverticula were larger than the colonic (2.5 cm *versus* 0.5-1.0 cm) and only four of the eight patients presented with colonic complaints. Anatomically, all the rectal diverticula except two originated from the lateral wall of the rectal ampulla, suggesting a possible lateral weakness. The majority of patients were asymptomatic and required no surgery. However, surgical treatment becomes necessary when an inflamed diverticulum progresses to abscess formation and perforation. An inflamed rectal diverticulum may be confused with a carcinoma at endoscopy. It is suggested that inattention during barium enema examination may contribute to the low reported incidence of rectal diverticula, as well as overfilling of the rectum which may completely obscure the diverticula.

8795 PROLONGED SYMPTOMATIC AND RADIOLOGICAL REMISSION OF COLONIC GAS CYSTS AFTER OXYGEN THERAPY.

(E.) Wyatt, A. P. (Brook Hosp., London, England). *Br. J. Surg.* 62(10):837-839, 1975.

Results of oxygen therapy in six patients (one man and five women, aged 53-78 yr) with pneumatosis cystoides intestinalis were described. The patients also presented with myocardial ischemia (1 case), chronic bronchitis and asthma (2 cases), pulmonary embolism and multiple hip surgery (1), asthma (1) and mitral valvotomy (1). All patients complained of frequent bowel actions and excessive flatus before therapy, four had mucus in stools, four had abdominal pain, three had frequent minor incontinence, and two had blood in stools. The physical signs of pneumatosis included an abdominal mass in three patients, rectal cysts in four, and cysts on sigmoidoscopy in five. During oxygen therapy, 8 liters/min of humidified oxygen was delivered through a mask resulting in 70 to 75% inspired oxygen and arterial oxygen concentrations greater than 300 mm Hg. Symptomatic relief was dramatic although two patients continued to have some mucus in stools and three complained of excessive flatus on followup. All the physical signs of pneumatosis disappeared during treatment but the mucosa still appeared edematous with a few hemorrhages on sigmoidoscopy at the end of treatment. Plain abdominal films showed the disappearance of encysted gas in every patient between the fourth and seventh day, while a barium enema examination performed the subsequent month revealed a return to normality in five cases. In the sixth case, residual cysts were visible in the region of the splenic flexure. One patient remained well at two yr. Pneumatosis recurred in two patients after one yr and 18 months, resp.; however, the symptoms were less severe than before and did not warrant further oxygen therapy. The presence of residual cysts in one patient at the end of treatment suggests that aggressive oxygen treatment should be continued for at least 48 hr after the complete radiologic disappearance of all cysts.

8796 SYMPATHETIC NEUROTRANSMITTER METABOLISM IN HIRSCHSPRUNG'S DISEASE.

(E.) Touloukian, R. J.; Morgenroth, V. H., III; Roth, R. H. (Yale Univ. Sch. Medicine, New Haven, Conn. 06510). *J. Pediatr. Surg.* 10(5):593-598, 1975.

Tyrosine hydroxylase activity was measured from full thickness segments of aganglionic and ganglionic colon of three male children (aged 3 days to 5 months) to investigate the factors responsible for the elevation in tissue norepinephrine levels during Hirschsprung's disease. Homogenized tissue samples were centrifuged at 104,000 x *g* for 90 min at 4 C and the supernatant was analyzed for hydroxylase activity in conjunction with added calcium ions, calcium chelators (EGTA) or norepinephrine. The tyrosine hydroxylase activity of the aganglionic colon was three times that of the ganglionic segment. Addition of calcium (100 μM) caused a threefold increase in tyrosine hydroxylase activity (0.90 pM DOPA/mg protein/min to 2.29 pM DOPA/mg protein/min) only within isolates of ganglionic intestine. EGTA had no effect on enzyme activity in either tissue but blocked the calcium activation of tyrosine hydroxylase in ganglionic supernatant. Norepinephrine (2×10^{-4} M) caused a 60% inhibition of tyrosine hydroxylase activity in ganglionic supernatants and a 14% inhibition in aganglionic supernatants. The addition of calcium had no effect on the tyrosine hydroxylase inhibition by norepinephrine in aganglionic supernatants, but it reduced the inhibitory effect to 11% in ganglionic supernatants. Patients with Hirschsprung's disease lack the intramural ganglionic cell which normally coordinates muscular activity by balancing the motor effects of the preganglionic cholinergic fibers with the inhibitory influence of the postganglionic adrenergic terminals. The elevation of tyrosine hydroxylase activity in aganglionic colon and its insensitivity to exogenous calcium or norepinephrine is further evidence of sympathetic overactivity in the aganglionic colon and suggests a basic enzymatic abnormality in the pathogenesis of this disease.

8797 NEONATAL SMALL LEFT COLON SYNDROME: INTRAMURAL NOT INTRALUMINAL OBSTRUCTION.

(E.) Philippart, A. I.; Reed, J. O.; Georgeson, K. E. (Children's Hosp. Michigan, Detroit, Mich. 48202). *J. Pediatr. Surg.* 10(5):733-740, 1975.

The characteristic findings of low intestinal obstruction in infants of diabetic mothers are described. Eight cases of small left colon syndrome were selected. All cases showed abdominal distention, bile-strained vomitus, absent spontaneous passage of meconium, and normal ganglion cell population. Gestation age varied from 36 to 40 weeks (mean age, 38 weeks). Initial radiologic findings were indistinguishable from Hirschsprung's disease. Four cases required surgery: two infants with cecal perforation and two with obstruction. Three of these four were treated by a colostomy and one case was exteriorized. All four biopsies were normal. The uncomplicated cases responded to barium enemas and nasogastric suction with a gradual increase in oral feeding. Meconium analysis was unreliable; evacuation of suspected meconium did not always correct the clinical picture. Hypoglycemia was present in all cases, but there was no correlation between its severity and the clinical course. Hyperbilirubinemia was frequent. Lasting symptoms of partial obstruction even after evacuation and incidence of late perforation of the cecum supported the impression that the syndrome results from an intramural rather than an intraluminal obstruction. The relation between glucose metabolism and bowel obstruction suggested a neurohumoral mechanism; the presence of glucagon decreased the motility of the descending colon, and hypoglycemia increased vagal stimulation to the midgut region. These concurrent stimuli produced a transition zone between midgut and hindgut that altered intestinal function.

8798 MUCOCELES OF THE APPENDIX. *(E.)*

Qizilbash, A. H. (Henderson General Hosp., Hamilton, Ontario, Canada L8V 1C3). *Arch. Pathol.* 99(10):548-555, 1975.

Sixty-four cases of hyperplastic polyp, mucinous cystadenoma, and cystadenocarcinoma of the appendix were studied in relation to the development of mucocele and "pseudomyxoma peritonei." In eight of the 33 with hyperplastic polyp (25 women and 8 men, aged 16-82 yr), the lesion was associated with mucinous cystadenoma. Three of these patients had multiple small hyperplastic and adenomatous polyps present in the adjacent mucosa of the cecum and ascending colon. Histologically, the polyps revealed hyperplastic tubules with saw-toothed appearance. In 11 of the 33 patients, paneth cells were identified in gland crypts. Argentaffin cells were also present. Mucinous cystadenoma was found in 35 cases (26 women and 9 men, aged 22-82 yr). Among these patients, the most common abnormality was cystic dilation (1-6 cm) of the lumen at the distal end. Dilated lumens were filled with thick, gelatinous mucus. The inflammatory reaction consisted of lymphocytes, macrophages, and foreign-body giant cells. The epithelium was thrown into papillary processes that were lined by columnar mucus-secreting epithelium with basal hyperchromic nuclei. Eight cases had hyperplastic foci. Generalized pseudomyxoma peritonei was rare. Five patients had mucinous cystadenocarcinoma (3 women and 2 men, aged 45-85 yr). In four cases, the appendix was transformed into mucocele. The gross appearance of the mucocele, cellular growth and nuclear atypia was more severe than in cystadenoma. Walls contained lakes of mucus-containing malignant epithelial and micro-glandular elements of carcinoma. It was suggested that the association between benign adenocarcinoma and mucous cystadenocarcinoma may represent an early developing phase. In addition, as the histological features of mucinous cystadenoma were identical to those of villous adenoma of the large intestine, the former disorder may represent the counterpart of villous adenoma within the appendix.

8799 BENIGN LYMPHOID POLYPS OF THE RECTUM. *(E.)*

Weller, M. H.; Feldman, P. S. (Univ. California Medical Center, San Diego, Calif. 92103). *Pediatr. Radiol.* 3(4):209-212, 1975.

The case report of a seven-yr-old girl with multiple clustered polyps in the ano-rectal area is presented. The polyps were noted at proctosigmoidoscopy and confirmed by air contrast barium examination. At surgery, four groups of clustered polyps and two solitary polyps were removed from the rectum. Microscopic examination demonstrated lymphoid tissue, the main mass of which was submucosal. The muscularis mucosa was replaced and focally fragmented by lymphocytes. Focal ulceration of the mucosa was noted, with infiltration by many lymphocytes and a few plasma cells. The histologic diagnosis was benign lymphoid polyps. Although retention polyps are the single most common type of colonic polyp in children, the presence of multiple clustered polyps in the rectum should alert the radiologist to the possibility of benign lymphoid polyps. The differential diagnosis of lymphoid polyps should include retention juvenile polyps, familial polyposis, Peutz-Jehgers syndrome, adenomatous polyps, and lymphoid hyperplasia. Retention polyps are usually single, and when multiple are generally not clustered. Familial polyposis will usually show colonic involvement with many more lesions. Peutz-Jehgers polyps are accompanied by small intestine polyps and mucosal pigmentation about the lips and gingiva. Adenomatous polyps are rare in children and even more infrequently multiple. The lesions in lymphoid hyperplasia are not limited to the rectosigmoid area and may show central umbilication. The prognosis is uniformly good in cases of lymphoid polyps, with as yet no documented recurrence or malignant change.

8800 UNIQUE CASE OF MESENTERIC FIBROSIS IN MULTIPLE POLYPOSIS. *(E.)* Gold, R. S.; Mecha, S. J. (Naval Regional Medical Center, Phila., Pa.). *Am. J. Surg.* 130(3):366-369, 1975.

A case study was reported of a 44-yr-old man with mesenteric fibrosis and multiple polyposis. Semiannual follow-up examination for familial polyposis revealed several small polyps in the rectal stump remaining from a previous subtotal colectomy. Palpation of the right side of the abdomen revealed a mass, 10 x 7 x 4 in, extending from the right subcostal region to the semicircular line. Four polyps were removed. Medical history of family showed diabetes on the paternal side and extensive polyposis on the maternal side with seven deaths due to colon carcinoma. All clinical tests were negative except for an elevated blood sugar. Abdominal angiogram showed an avascular mass involving most of small intestine. A large solid ovoid tumor, 27 x 24 x 14 cm, was removed and a proximal jejunoterminal ileostomy was performed. Microscopic examination revealed mesenteric fibromatosis. Nine yr postcolectomy for familial polyposis, the patient was doing well with no evidence of anemia or liver dysfunction. Although this patient did not require long-term i.v. hyperalimentation, it may be suggested to prevent nutritional loss and to increase survival rate after a massive resection.

8801 THE PSEUDOMEMBRANOUS COLITIS ASSOCIATED WITH CLINDAMYCIN THERAPY--A VIRAL COLITIS. *(E.)* Steer, H. W. (Southampton General Hosp., Southampton, England). *Gut* 16(9):695-706, 1975.

Four patients (one woman and three men, aged 61-74 yr) are described who developed pseudomembranous colitis in association with clindamycin therapy (150-300 mg every six hr). Diarrhea occurred from seven to 25 days after initiation of clindamycin therapy, and was associated with pyrexia, tachycardia, episodes of relative hypotension, nonspecific abdominal pains, variable abdominal distension, and a polymorphonuclear leukocytosis. Stool cultures did not reveal any pathogenic bacteria. On sigmoidoscopy, the rectal mucosa was erythematous and its surface was covered with plaques of a creamy exudate. Rectal biopsies from two patients were studied under the electron microscope and compared with the ultrastructural appearance of the rectal mucosa from seven normal subjects. Colonic epithelial cells from the two patients contained virus-like particles about 50 nm in diameter and bound by a limiting membrane (7 nm thick). The particles were first observed in the supranuclear region of the colonic epithelial cells, were shed into the colonic lumen, and became related to the surface membranes of the colonic epithelial cells. Similar particles were present in large numbers in the pseudomembrane and in the endothelial cells of capillaries near the sites of colonic epithelial ulceration. Ultrastructural evidence for a viral colitis suggests that viral infection is responsible for epithelial ulceration, and results in the development of the pseudomembrane in colitis associated with clindamycin therapy.

8802 FAMILIAL PSEUDOMEMBRANOUS COLITIS AND ITS RELATION TO LINCOMYCIN THERAPY. *(E.)* Harrod, M. J. E.; Brown, M. S.; Weinberg, A. G.; Harkness, W. N.; Goldstein, J. L. (Univ. Texas Southwestern Medical Sch., 5323 Harry Hines Blvd., Dallas, Tex. 75235). *Am. J. Dig. Dis.* 20(9):808-812, 1975.

Severe pseudomembranous colitis was observed in three members of a single family: the father and two of his children, a 10-yr-old girl and a 17-yr-old boy. The father and the son had received the antibiotic lincomycin (300 or 600 mg, i.m.) prior to the onset of their symptoms. Death occurred seven days after the onset of illness in the boy and 16 days after the onset of illness in the girl. Although the disease in the daughter was apparently precipitated by intestinal obstruction, the autopsy findings were remarkably similar to those in her brother. Histological sections of the colon from the siblings showed pronounced hypersecretion, with an extensive pseudomembrane composed of mucus, fibrin, leukocytes, and bacteria overlying the mucosal surface. Foci of intense mucosal inflammation and necrosis were evident with increased numbers of plasma cells in the mucosa. In the father, proctoscopic findings of small yellowish plaques in association with abundant mucus secretion were compatible with a diagnosis of pseudomembranous colitis presumably related to lincomycin therapy. The occurrence of pseudomembranous colitis in three members of this family and the presence of colon disease in two other relatives (the father's sister and father) suggests that some common underlying genetic defect involving the colon might be responsible for the disease state in this family and, in addition, raises the possibility that antibiotic-induced pseudomembranous colitis in some patients may be the result of a pharmacogenetic interaction.

8803 A REAPPEARANCE OF ANTIBIOTIC-INDUCED PSEUDOMEMBRANOUS ENTEROCOLITIS. *(E.)* Tully, T. E.; Feinberg, S. B. (Veterans Admin. Hosp., Minneapolis, Minn.). *Radiology* 110(3):563-567, 1974.

Four cases of antibiotic-induced pseudomembranous enterocolitis are described. The cases involved a 68-yr-old man, a 43-yr-old man, a 54-yr-old woman, and an 80-yr-old woman, each of whom had been given lincomycin (600 mg, 3-4 times daily) or clindamycin (150 mg, 4 times daily). Explosive diarrhea, prostration, fever, abdominal distention, and/or rapid weight loss developed 1 to 4 days later. Proctoscopic findings included edematous mucosa with or without ulceration, and a dusky mucosa with a white pseudomembrane. Roentgenographic findings confirmed the pseudomembrane formation and showed thickening of the mucosal folds. Hyperalimentation and continued bowel rest were responsible for a gradual improvement in two patients, one of whom also received mycostatin; the other two patients died. Microscopically, the pseudomembrane in such cases consists of a mixture of necrotic cellular debris, fibrin, mucous, and a variable number of inflammatory cells which form as a result of fibrinoid necrosis of the superficial mucosa. Staphylococcal infection, predisposing debilitating conditions, and antibiotic therapy may have etiologic significance. The diagnosis of pseudomembranous enterocolitis should be considered in any patient receiving antibiotics who suddenly experiences severe diarrhea, sudden dehydration, prostration with shock, and fever. The most definitive diagnostic procedure is proctoscopic examination. The basic treatment consists of bowel rest, discontinuing the offending antibiotics, institution of antistaphylococcal antibiotics, and treatment of shock and dehydration. Steroids, hyperalimentation, and changing the bowel flora may also be helpful. Despite vigorous treatment, the mortality rate ranges from 50 to 90%.

8804 THE IMPORTANCE OF BACTEROIDES AS A CAUSE OF SEVERE SEPSIS AFTER COLO-RECTAL SURGERY [abstract]. *(E.)* Keighley, M. R. B.; Burdon, D. W.; Slaney, G.; Cooke, W. T.; Alexander Williams, J. (Gen. Hosp., Birmingham, England). *Gut* 16(5):408, 1975.

8805 PROSTAGLANDINS IN HUMAN COLONIC CARCINOMA [abstract]. *(E.)* Bennett, A.; Del Tacca, M. (King's Coll. Hosp., London, England). *Gut* 16(5): 409, 1975.

8806 APPENDICITIS AND DIETARY FIBRE [abstract]. *(E.)* Cove Smith, J. R.; Langman, M. J. S. (City Hosp., Nottingham, England). *Gut* 16(5):409, 1975.

8807 PROBLEMS OF A PERMANENT COLOSTOMY [abstract]. *(E.)* George, W. D.; Eardley, A.; Davis, F. N.; Schofield, P. F. (Univ. Hosp., South Manchester, England). *Gut* 16(5):408-409, 1975.

8808 COMPARATIVE EFFECTS OF CODEINE AND SENNA ON THE MOTOR ACTIVITY OF THE LEFT COLON [abstract]. *(E.)* Waller, S. L. (Cent. Middlesex Hosp., London, England). *Gut* 16(5):407-408, 1975.

8809 CHRONIC LESIONS OF RABBIT BOWEL DUE TO CONTACT WITH ANTISEPTIC SKIN PREPARATION [abstract]. *(E.)* Orr, M. M.; Tamarind, D. L.; Cook, J.; Fincham, W. J.; Hawley, P. R.; Quilliam, J. P.; Irving, M. H. (St. Bartholomew's Hosp., London, England). *Gut* 16(5):401, 1975.

8810 ORAL ELECTROLYTE LOAD FOR CLEANSING THE COLON [abstract]. *(E.)* Zvarqulis, J. E.; Williams, C.; Rhodes, J. B. (Univ. Kansas Med. Cent., Kansas City, Kans.). *Gastroenterology* 68(4):1062, 1975.

8811 PROCTALGIA FUGAX REVISISTED [abstract]. *(E.)* Panitch, N. M.; Schofferman, J. A. (Harbor Gen. Hosp., Torrance, Calif.). *Gastroenterology* 68(4):1061, 1975.

8812 PREDICTION OF LOCAL RECURRENCE AFTER ABDOMINO-PERINEAL RESECTION FOR CANCER OF THE RECTOSIGMOID [abstract]. *(E.)* Levin, B.; Moossa, A. R.; Ree, P. C.; Marks, J. E.; Platz, C. E.; Skinner, D. B. (Dept. Med., Univ. Chicago, Chicago, Ill.). *Gastroenterology* 68(4):1059, 1975.

8813 COLONOSCOPY WITHOUT FLUOROSCOPY [abstract]. *(E.)* Waye, J. D. (Mt. Sinai Sch. Med., New York, N.Y.). *Gastroenterology* 68(4):1051, 1975.

8814 THE VALUE OF COLONOSCOPY FOR THE DIAGNOSIS OF CROHN'S DISEASE [abstract]. *(E.)* Vantrappen, G.; Geboes, K. (Univ. Hosp. St. Rafael, Leuven, Belgium). *Gastroenterology* 68(4):1048, 1975.

8815 VALUE OF COLONOSCOPY IN ANTIBIOTIC-RELATED COLITIS [abstract]. *(E.)* Roseman, D. M.; Elliott, M. L. (Scripps Mem. Hosp., San Diego, Calif.). *Gastroenterology* 68(4):1045, 1975.

8816 INTERNAL STIFFENER AS AN AID TO COLOSCOPY WITH THE ACMI F9A COLOSCOPE [abstract]. *(E.)* Rogers, B. H. G. (Grant Hosp., Chicago, Ill.). *Gastroenterology* 68(4):1044, 1975.

8817 HEMANGIOMAS OF THE CECUM, GASTROINTESTINAL HEMORRHAGE AND CARDIOVASCULAR INSUFFICIENCY, A NEWLY RECOGNIZED SYNDROME [abstract]. *(E.)* Rogers, B. H. G.; Adler, F. (Grant Hosp., Chicago, Ill.). *Gastroenterology* 68(4):1044, 1975.

8818 TECHNIC OF COLONSCOPIC ELECTROSNARE EXCISION OF SESSILE POLYPOID TUMORS [abstract]. *(E.)* Rand, A. A. (Albert Einstein Coll. Med., Bronx, N.Y.). *Gastroenterology* 68(4):1043, 1975.

8819 ENDOSCOPIC MARKING OF COLONIC LESIONS [abstract]. *(E.)* Ponsky, J. L.; King, J. F. (Timken Mercy Hosp., Canton, Ohio). *Gastroenterology* 68(4):1041, 1975.

8820 RIGHT COLON HEMANGIOMAS AS CAUSE OF CHRONIC LOWER GASTRO-INTESTINAL HEMORRHAGE DEFINED BY FIBERCOLONOSCOPY [abstract]. *(E.)* Kleckner, F. S.; Khubchandani, I. T.; Stasik, J.; Leshock, L. (Sacred Heart Hosp. Cent., Allentown, Pa.). *Gastroenterology* 68(4):1036, 1975.

8821 ACUTE SUBHEPATIC APPENDICITIS. *(Rus.)* Kalugina, G. V. (Municipal Clinical Hosp. No. 67, Moscow, USSR). *Sov. Med.* (2):103-105, 1975.

8822 THE INFLUENCE OF EXPERIMENTAL INFLAMMATION OF THE APPENDIX ON IMMUNOGENESIS. *(Rus.)* Platash, V. I. (Dept. Pathoanatomy, Aktyubinsk Medical Inst., USSR). *Arkh. Patol.* 37(3):1-96, 1975.

8823 COLONOSCOPY (TECHNIQUE, INDICATIONS, RESULTS). *(Rus.)* Savelyev, V. S.; Buyanov, V. M.; Balalykin, A. S.; Voskresensky, P. K. (S. I. Spasokukotskiy Faculty Clinic Surgery, N. I. Pirogov Second Moscow Medical Inst., Moscow, USSR). *Khirurgiia (Mosk.)* (5):88-93, 1975.

8824 MANAGEMENT OF EXTERNAL NON-FORMED INTESTINAL FISTULAS IN CHILDREN. *(Rus.)* Vitsin, B. A.; Kolomiytsev, P. I.; Shapiro, G. D. (Hospital Clinic Surgery, Novosibirsk Region Clinical Hosp., Novosibirsk, USSR). *Khirurgiia (Mosk.)* (5):122-125, 1975.

8825 ANTIGEN DEGRADATION IN HUMAN COLON ECOSYSTEMS: AN EFFECT OF THE HOST OF ENTERIC BACTERIAL DEGRADATION OF THE BLOOD GROUP B-LIKE ANTIGEN ON E. coli [abstract]. *(E.)* Cromwell, C. L.; Hoskin, L. C. (VA Hosp., Cleveland, Ohio). *Gastroenterology* 68(4):916, 1975.

8826 RADIOGRAPHIC DEMONSTRATION OF RAT COLONIC TUMORS [abstract]. *(E.)* Gluckman, J.; Skucas, J.; Narisawa, T.; Turner, N. D. (Univ. Rochester Sch. Med., Rochester, N.Y.). *Gastroenterology* 68(4):901, 1975.

8827 THE NATURE OF HAEMORRHOIDS. *(Eng.)* Thomson, W. H. F. (Southampton General Hosp., Southampton, England). *Br. J. Surg.* 62(7): 542-552, 1975.

8828 CYSTIC INTESTINAL PNEUMATOSIS. *(It.)* Amoroso, L.; Anardi, V.; Marra, F.; Valituitti, P.; Crudele, G. (Ente Regionale Ospedaliero S. Giovanni di Dio e Ruggi d'Aragona, Salerno, Italy). *Chir. Gastroenterol.* 8(4):396-407, 1974.

8829 RECENT DATA ON THE RADIO-IMMUNOLOGICAL QUANTITY DETERMINATION OF THE CARCINOEMBRYONIC ANTIGEN. *(Fr.)* von Kleist, S. (Institut de Recherches scientifiques sur le Cancer, 94800 Villejuif, France). *Bordeaux Med.* 8(6):677-680, 1975.

8830 ENTEROSPASM. *(Ger.)* Nikolov, P. N. (Medizinische Fakultat Sofia, Sofia, Bulgaria). *Radiol. Diagn. (Berl.)* 15(6):781-785, 1974.

8831 THE COMBINED APPEARANCE OF SPINAL-ANOMALIES AND DIVERTICLES OF COLON. *(Ger.)* Mollers, I.; Zimmermann, W. (Krankenhaus fur Naturheilweisen, 8 Munchen-Harlaching, Sanatoriumsplatz 2, Germany). *Med. Klin.* 70(17):766-770, 1975.

8832 X-RAY CONTROL IN BLEEDING OF THE LARGE INTESTINE. *(Ger.)* Cen, M. (Abteilung Radiologic, Knappschaftskrankenhauses Wurselen-Bardenberg, Germany). *Diagnostik* 8(2):59-61, 1975.

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8834 RADIATION COLITIS. INTEREST OF MESENTERIC ANGIOGRAPHY. *(Fr.)* Verwaerde, J. V.; Gignoux, M.; Humeau, F.; Rousselot, P.; Valla, A. (Service de Gastroenterologie, C. H. U., avenue G.-Clemenceau, F 14033 Caen, France). *Arch. Fr. Mal. App. Dig.* 64(1):53-57, 1975.

8835 NEOPLASTIC SIGMOIDO-JEJUNO-COLIC FISTULA. *(Fr.)* Berutti, A.; Bohuard, J.; de Saint-Julien, J.; Pupee, J. C. (Hopital d'Instruction des Armees, Sainte Anne, 83000, Toulon, France). *Chirurgie* 101(4):243-244, 1975.

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8837 COMMON GASTROENTEROLOGICAL PROBLEMS. VI. THE IRRITABLE BOWEL SYNDROME. *(Eng.)* Salter, R. H. (Cumberland Infirmary, Carlisle, England). *Practitioner* 214(1284):816-820, 1975.

8838 X-RAY DIAGNOSIS OF LARGE INTESTINE POLYPS BY THE GYROSCOPIC TV. *(Jpn.)* Sasaki, T. Maruyama, M.; Funada, A.; Baba, Y.; Sugiyama, N.; Takekoshi, T.; Takagai, K.; Endo, T.; Nakamura, K.; Kumakura, K. (Cancer Institute Hosp., Japan). *Rinsho Hoshansen* 20(3):195-202, 1975.

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8841 NUCLEAR MORPHOLOGY IN NEGATIVE AND FALSE-NEGATIVE RECTAL BIOPSIES. *(It.)* Rilke, F.; Clemente, C.; Pilotti, S. (Istituto Nazionale Studio Cura Tumori, Milan, Italy). *Tumori* 61(2):199-209, 1975.

8842 SOME LEUKOCYTE ENZYME ACTIVITIES IN ACUTE APPENDICITIS IN CHILDREN. *(Rus.)* Generalov, A. I.; Komissarova, I. A.; Kalashnikova, O. A. (Moscow Res. Inst. Pediatric Surgery, USSR). *Vopr. Okhr. Materin. Det.* 20(6):85-86, 1975.

8843 APPENDICITIS IN RELATION TO GYNECOLOGICAL AND OBSTETRICAL POCESSES. (BIOGRAPHIES OF JOHN BENJAMIN MURPHY AND CHARLES McBURNEY). *(Sp.)* Sanchez Arcas, R. (No affiliation given). *Toko-Ginecol. Pract.* 33(358):235-242, 1975.

8844 IDENTIFICATION OF A NEW ONCO-FOETAL ANTIGEN EXTRACTED FROM HUMAN COLON CARCINOMA [abstract]. *(Eng.)* Fritsche, R.; Mach, J. P. (Institut de biochimie, Universite de Lausanne, CH-1011, Lausanne, Switzerland). *Experientia* 31(6):719, 1975.

8845 ACUTE ISCHEMIA OF THE LEFT HALF OF THE LARGE INTESTINE FOLLOWING RECONSTRUCTION OF THE AORTA AND ILIAC ARTERY. *(Rus.)* Peregudov, I. G.; Lebedev, L. V. (S. M. Kirov Military Medical Acad., Leningrad, USSR). *Vestn. Khir.* 114(5):130-131, 1975.

8846 TRIAL OF COLOTEN IN DISEASES OF THE COLON: 40 CASES. *(Fr.)* Tabbane, S. (Hospital Charles-Nicolle, Tunis, Tunisia). *Med. Chir. Dig.* 3(5):357-359, 1974.

8847 SPIROCHETES IN THE INTESTINAL MUCOSA. *(Rus.)* Voino-Iasenetskii, M. V.; Snigirevskaia, E. S.; Belianin, V. L. (Inst. Experimental Medicine, Leningrad, USSR). *Arkh. Patol.* 37(5):34-40, 1975.

8848 GASTROINTESTINAL MANIFESTATIONS OF ENDOMETRIOSIS: 63 CASES. *(Fr.)* Rochet, Y.; Lansac, J.; Drogou, F. (Clinique Gynecologique, Universite Claude-Bernard, Hopital Eduoard-Herriot, 69734 Lyon Cedex 2, France). *Lyon Chir.* 71(4):247-252, 1975.

8849 TRIAL OF PRIFNIUM BROMIDE TO TREAT DISEASE OF THE COLON. *(Fr.)* Baillet, J.; Marti, R. (C.H.U., 80000 Amiens, France). *Sem. Hop. Ther.* 51 (2):95-97, 1975.

8850 CANCER OF THE COLON: IMMUNOLOGIC APPROACH TO DIAGNOSIS. *(E.)* Pollard, H.M.; Molnar, I. G. (Dept. Internal Medicine, Univ. Michigan, Ann Arbor, Mich. 48104). *Univ. Mich. Med. Cent. J.* 40 (2):62-66, 1975.

8851 ULCERATIVE NECROTIZING ENTEROCOLITIS IN PREMATURE INFANTS. *(It.)* Beau, A. (Faculte Medecine, Nancy, France). *Bull. Soc. Med. Afr. Noire Lang. Fr.* 22(3):217-219, 1975.

8852 INTESTINAL INTUSSUSCEPTION WITH SUBTOTAL COLONIC RESECTION. *(Sp.)* Ollero Caprani, J. M.; Rollan Villamarin, V. (Hospital Nino Jesus, Madrid, Spain). *Acta Pediatr. Esp.* 33(388):125-130, 1975.

See also, 8017, 8056, 8297, 8379, 8402, 8406, 8411, 8417, 8433, 8436, 8465, 8469, 8488, 8499, 8574, 8644, 8697, 8703, 8721, 8724, 8725, 8726, 8729, 8736, 8859, 8862, 8867, 8891, 8915, 8972, 9393, 9396, 9397.

LARGE INTESTINE

Ulcerative Colitis

8853 THE LATE STAGE OF ULCERATIVE COLITIS: A LONG-TERM RADIOLOGICAL FOLLOW-UP. *(Ger.)* Burgener, F. A. (Dept. Radiology, Univ. Rochester, N.Y.). *Fortschr. Geb. Roentgenstr. Nuklearmed.* 121 (6):761-767, 1974.

Results are presented for radiological followups lasting 5 to 33 yr on 16 patients (7 men and 9 women, aged 20-68 yr) with histologically confirmed ulcerative colitis. All of these patients had (1) been asymptomatic for at least one yr, (2) radiological evidence of complete or partial involvement of the colon but no signs of ulcerations or pseudopolyps, and (3) no history of colectomy and no colectomy performed during the first five yr of follow-up. Of these 16 patients, three eventually underwent partial colectomy: two for carcinoma after 8 and 32 yr, resp., and one for benign rectosigmoid stenosis. Except for increases in the presacral space in three cases, eight patients in the late stages of ulcerative colitis had no evidence of changes on barium enema examinations. However, only four of these eight patients were asymptomatic. In three patients, further shrinkage of the affected colon occurred; in one case, this was accompanied by the development of rectosigmoid stenosis. In the remaining five patients, radiological changes characteristic of ulcerative colitis had regressed significantly, so that the colon gradually returned to an almost normal length and diameter. Haustration reappeared, as did the mucosal relief, in all five cases; however, the latter was abnormally coarse. Some of these patients developed complications which included recurrence of ulcerations and pseudopolyps (3 cases) and one case each of rectal and cecal carcinoma. One yr after successful tumor resection and ileocolostomy, the latter patient had a recurrence of acute ulcerative colitis in the remaining colon and the anastomosis. It is concluded that there is no such thing as "burnt-out" colitis since changes continue to occur in radiological findings.

8854 SELECTIVE IMMUNOGLOBULIN A DEFICIENCY, ULCERATIVE COLITIS, AND GLUTEN-SENSITIVE ENTEROPATHY — A UNIQUE ASSOCIATION. *(E.)* Falchuk, K. R.; Falchuk, Z. M. (Dept. Medicine, Massachusetts General Hosp., Boston, Mass.). *Gastroenterology* 69(2):503-506, 1975.

A case of selective IgA deficiency, malabsorption, gluten-sensitive enteropathy (celiac sprue), and ulcerative colitis is reported. A 47-yr-old Caucasian woman was hospitalized with a 14-yr history of intermittent watery diarrhea and a weight loss of 34 lb over the preceding eight weeks. One yr earlier, steatorrhea, thought to be secondary to gluten-sensitive enteropathy, was diagnosed. Gluten restriction was associated with weight gain, improved intestinal absorption, and decreased steatorrhea and diarrhea. Abdominal examination at the present hospitalization revealed epigastric and umbilical tenderness without guarding or rebound. Sigmoidoscopy demonstrated an edematous and friable rectal mucosa with ulcerations, and a barium enema revealed a colon without haustral markings. Colonoscopy confirmed the presence of active colitis and biopsies confirmed the presence of mucosal lesion with crypt abscesses. A jejunal biopsy showed flat mucosa with some loss of nuclear polarity, vacuolization of the surface epithelial cells, and infiltration of the lamina propria with increased numbers of plasma cells and lymphocytes. The patient gained weight on a strict gluten-free diet with p.o. iron, but the abdominal pain and diarrhea failed to respond, even when prednisone was added. The patient was rehospitalized five months later with recurrent weight loss and persistent diarrhea. Immunoelectrophoresis confirmed the absence of serum IgA. The jejunal mucosal architecture showed improvement and all brush border enzymes except lactase showed normal activity. A total proctocolectomy was performed and the histopathology confirmed the presence of active colitis with numerous ulcers and microabscesses. The patient has since done well on a gluten-free diet. Histocompatibility antigen typing revealed her phenotype as 1,8. The occurrence of immunoglobulin A deficiency in a patient with ulcerative colitis and gluten-sensitive enteropathy is uncommon.

8855 DISEASE ACTIVITY AND SERUM PROTEINS IN ULCERATIVE COLITIS: IMMUNOCHEMICAL QUANTITATION. *(E.)* Marner, I. L.; Friborg, S.; Simonsen, E. (Dept. Medical Gastroenterology, Odense Sygehus, Odense, Denmark). *Scand. J. Gastroenterol.* 10(5): 537-544, 1975.

The relation between the immunoelectrophoretical quantitation of serum proteins and the clinical activity of patients with ulcerative colitis was studied. Fifty patients (33 women and 17 men, aged 10-72 yr; mean age 35 yr) were studied. Twenty-six of these patients (21 women and 5 men) were suffering from ulcerative colitis in various stages. The ten serum proteins analyzed by cross-immunoelectrophoresis were: pre-albumin, orosomucoid, haptoglobin, ceruloplasmin, α_2-macroglobulin, transferrin, IgA, IgG, IgM and β-lipoprotein. The clinical conditions were classified into five basic groups: active febrile, active afebrile, unstable, remission, and restitution. Ceruloplasmin remained unchanged at 0.4 g/l upon reaching the unstable/remission period. The levels of α_2-macroglobulin, pre-albumin and transferrin all significantly increased in the active febrile/active afebrile and active afebrile/unstable conditions. Haptoglobin and orosomucoid levels decreased (from 6.5 to 2.0 g/l and 3.4 to 0.8 g/l, resp.) with decreasing clinical severity. There were no significant changes in IgA, IgG or IgM levels throughout the clinical course. The observed changes in serum protein patterns during the course and treatment of ulcerative colitis might prove important with respect to daily observations of the clinical condition. The serum protein levels of orosomucoid and haptoglobin were the most indicative of the clinical condition. The level of pre-albumin may be valuable in severely ill patients when treatment change is warranted.

8856 ASSESSMENT OF SEVERITY IN COLITIS: A PRELIMINARY STUDY. *(E.)* Lennard-Jones, J. E.; Ritchie, J. K.; Hilder, W.; Spicer, C. C. (St. Mark's Hosp., City Road, London ECIV 2PS, England). *Gut* 16(8):579-584, 1975.

A classification system for the severity of acute colitis was constructed by correlating the clinical features, noted soon after admission, of patients with the success of drug treatment or the need for emergency surgery. Data was collected from 181 admissions to one hospital during a five-year period, and the clinical features were analyzed singularly, or in combinations of up to five. The success of the treatment regimens was determined by the death rate during treatment. Many of the 56 clinical features studied were of no value in predicting the outcome of the attack. The four features of greatest predictive value were maximum daily body temperature, maximum daily pulse rate, bowel frequency and plasma albumin. The simplest and most discriminating prediction at the end of the first 24 hr was obtained by combining observations of maximum body temperature and the number of stools passed. A patient who passed less than eight stools on the first day and had a maximum body temperature less than 38 C had a high probability of responding to medical treatment. Conversely, if both values were elevated, the probability of successful medical treatment was only one in five. Serial observations of temperature or pulse rate over the first four days gave more prognostic information than observations confined to the first day. A patient with a maximum temperature greater than 38 C on the fourth day had about one chance in eight of responding to medical treatment. In this series, medical treatment failed in 37 cases; there were four deaths, one during medical treatment and three after urgent surgical treatment. An additional eight patients underwent immediate surgical treatment when abdominal radiography revealed colonic dilation and mucosal islands; no analysis of the prognostic value of other clinical features was possible in this group. A simple classification of severity in acute colitis is proposed from these results as a basis for prospective testing in other hospitals.

8857 A CONTROLLED TRIAL OF AZATHIOPRINE IN THE MANAGEMENT OF CHRONIC ULCERATIVE COLITIS. *(E.)* Rosenberg, J. L.; Wall, A. J.; Levin, B.; Binder, H. J.; Kirsner, J. B. (Section of Gastroenterology, Univ. Chicago, 940 E. 59th St., Chicago, Ill. 60637). *Gastroenterology* 69(1):96-99, 1975.

A double-blind, controlled outpatient trial of azathioprine was performed in 30 patients with chronic, nonspecific ulcerative colitis. The subjects were randomized into placebo- (14) or drug-treatment (16 patients, 1.5 mg/kg/day) groups. All other medication was discontinued with the exception of prednisone. Patients were observed for possible drug toxicity, general health and bowel habits. Proctosigmoidoscopy and rectal biopsies were also performed. Comparison of the mean scores for the number of bowel movements/day, the state of health and endoscopic and biopsy findings for the first and last 3 wk, and for the first and last 3 mo of the study showed no significant differences either within the same group or between groups. A definite trend toward improvement in x-ray could not be determined after azathioprine administration. Prednisone was discontinued in seven patients in the azathioprine group compared with one in the placebo group, a significant difference. The average reduction in steroid dosage in the drug-treatment group at the end of the trial (-11.5 mg/day) was significantly greater than in the placebo group (-6.1 mg/day). No adverse side effects were seen. Follow-up within 2 months after discontinuation of both drugs showed that four patients in the azathioprine group relapsed, including one who developed a toxic megacolon, compared to none in the placebo group. These results suggest that the addition of azathioprine to the treatment regimen of patients with chronic, nonspecific ulcerative colitis who require steroids may permit significant reductions in steroid dosage without worsening of the disease.

8858 SERIAL CEA TITERS AND ULCERATIVE COLITIS [abstract]. *(E.)* Gardner, R. C.; Feinerman, A. E.; Kantrolitz, P. A.; Zamcheck, N. (Boston City Hosp., Boston, Mass.). *Gastroenterology* 68(4): 897, 1975.

8859 PROSPECTIVE EVALUATION OF THE RESULTS OF SURGERY IN CHILDREN WITH INFLAMMATORY DISEASE OF COLON [abstract]. *(E.)* Fierst, S. M. (Brooklyn-Cumberland Med. Cent., N.Y.). *Gastroenterology* 68(4):892, 1975.

8860 FALLING CIRCULATING CEA LEVELS DESPITE SEVERE PROGRESSIVE ACUTE ULCERATIVE COLITIS: A POOR PROGNOSTIC SIGN [abstract]. *(E.)* Feinerman, A. E.; Gardner, R. C.; Gootblatt, S.; Kantrowitz, P.; Zamcheck, N. (Boston City Hosp., Boston, Mass.). *Gastroenterology* 68(4):891, 1975.

8861 THE PMN LEUCOCYTE AND COLONIC EPITHELIAL CELL IN ULCERATIVE COLITIS [abstract]. *(E.)* Dobbins, W. O.; Hoxter, R. (George Washington Univ. Med. Cent., Washington, D.C.). *Gastroenterology* 68 (4):884, 1975.

8862 EFFECTS OF HYPERTONIC ENEMAS ON THE RECTAL MUCOSA [abstract]. *(E.)* Devroede, G.; Leriche, M.; Sanchez, G.; Rossano, J. (Centre Hospitalier Univ., Sherbrooke, Quebec, Canada). *Gastroenterology* 68(4):882, 1975.

See also, 8411, 9004, 9183, 9319, 9334, 9370, 9399, 9402, 9403, 9404, 9407, 9408, 9410, 9412, 9413.

PANCREAS

8863 PROPORTIONAL MORTALITY AMONG ALCOHOLICS. *(E.)* Monson, R. R.; Lyon, J. L. (Harvard Sch. Public Health, 677 Huntington Ave., Boston, Mass. 02115). *Cancer* 36(3):1077-1079, 1975.

A cohort mortality study of 1139 male and 243 female chronic alcoholics was performed to test the hypothesis that there is a positive association between chronic alcoholism and carcinoma of the pancreas. The mortality rate among these subjects was compared with that expected on the basis of U.S. rates. Among the 894 subjects who died, a proportional mortality ratio (PMR) of greater than one was observed for tuberculosis, alcoholism, epilepsy, pneumonia, gastric or duodenal ulcer, and cirrhosis. The absolute risk of death due to diseases of the circulatory system, respiratory disease other than pneumonia, suicide, and other external causes also appeared to be increased among alcoholics. The lowest PMR (0.2) was associated with infectious diseases other than pneumonia, the next lowest PMRs being associated with vascular lesions of the central nervous system (0.6) and all other causes (0.5). Based on a comparison of proportional cancer mortality for various sites, there was no evidence that cancer of the pancreas occurs with excess frequency among alcoholics; three deaths were observed, and 5.1 were expected. The largest ratios were seen for cancer of the larynx, buccal cavity and pharynx, esophagus, and lung. Thus, it appears that there is no association between alcohol consumption and cancer of the pancreas; likewise, there was no support for an association between alcohol consumption and cancer of the prostate.

8864 PATHOLOGICAL AND RADIOLOGICAL STUDY OF THE PANCREATIC DUCTS FROM A FUNCTIONAL POINT OF VIEW. *(Fr.)* Borelly, J.; Fays, J.; Bonhomme, J. C.; Mangin, C.; Cayotte, J. L. (U.E.R. Medicale A, 30 rue Lionnois, F. 54019 Nancy, France). *Arch. Anat. Pathol. (Paris)* 22(4):253-259, 1974.

In 170 adult subjects free from lesions of the bilio-pancreatic sphere, duodenopancreatic blocs were removed at autopsy; 139 of these were kept to study the functional value of the Santorini (S.) duct. Radiological, anatomical and histological studies were performed as well as moldings (49) of the communicating duct and the bilio-pancreatic junction. Thirty-seven cases where the S. duct was functional were investigated from two points of view: (1) the morphological aspect of the S. duct in either a minor or major role, and (2) the functional aspect, when there is communication between the S. duct and the duct of Wirsung (W.), or when there is no such communication. An important discovery was that in females the distribution was closest to the embryological disposition, while in males the distribution was such that the S. duct could supplement an obstructed W. duct at the level of the bilio-pancreatic junction. Histological study of the caruncules revealed the importance of the sphincter of Oddi, the thickening of which coincided with flattened ducts. It is concluded that there is a correlation between the method of opening of Oddi's sphincter and the degree of permeability of the S. duct.

8865 HISTOCHEMICAL STUDIES OF PANCREATIC CALCULI. *(E.)* Takahashi, W.; Matsushiro, T.; Suzuki, N.; Sato, T. (Tohoku Univ. Sch. Medicine, Sendai, Japan). *Tohoku J. Exp. Med.* 116(1):1-8, 1975.

Histochemical and mineralogical analyses of surgically removed pancreatic calculi were performed in order to determine their composition and pathogenesis. Fourteen pancreatic calculi obtained from pancreatic lithiasis patients at surgery were analyzed by infrared spectrophotometry and, following decalcification, were fixed, sectioned, stained and studied microscopically. Infrared spectra showed 13 stones to be calcium carbonate and one to be calcium phosphate. Decalcification of the calcium carbonate stones was complete by 30 hr, but the calcium phosphate stone required 24 days for completion. The calcium carbonate stones stained positively with alcian Blue at a pH of 2.4 but not at 1.0. By the Scott-Dorling method, alcianophilia was seen with 0.1 M $MgCl_2$ but not with 0.2 M $MgCl_2$. Beta-metachromicity was seen with toluidine blue, and all of the calcium carbonate calculi were positive to colloidal iron but only weakly positive to PAS. Calcium phosphate calculi responded to Bieschowskys' silver impregnation. The staining characteristics of the calcium phosphate calculi indicated that a major portion of the matrix was composed of collagen fibers, while the characteristics of the calcium carbonate calculi indicated a reticular organic matrix. The carbonate stones were formed with matrices of reticulated mucosubstances suggestive of acidic glycoprotein, and all of these stones were found intraductally. Calcium phosphate stones showed a fibrillar structure, suggesting degenerating collagen fibrils and indicating pathologic calcification of parenchyma. The results infer that different mechanisms are involved in the development of each type of calculus.

8866 PANCREATIC ASCITES: THE ROLE OF ENDOSCOPIC PANCREATOGRAPHY. *(E.)* Davis, R. E.; Graham, D. Y. (Baylor Coll. Medicine, 1200 Moursund Ave., Houston, Tex. 77025). *Am. J. Dig. Dis.* 20(10): 977-980, 1975.

Endoscopic retrograde cholangiopancreatography (ERCP) was used to demonstrate a pancreatic pseudocyst in a patient with pancreatic ascites. A 54-yr-old woman was hospitalized with a three-month history of weight loss and a one-month history of increasing abdominal girth and ankle swelling. The patient was chronically ill with muscle wasting of the upper proximal muscle groups. Abdominal examination revealed massive ascites. Paracentesis revealed a clear yellow fluid with a protein content of 3.8 g/dl. Ascitic fluid amylase was 24,480 Somogyi units, lipase was 24.8 units, and the WBC count was 45 cells/mm^3. Peritoneal biopsy demonstrated fibrosis and mesothelial cell hyperplasia. Upper gastrointestinal barium study was normal. Sixteen days after admission, the patient underwent a ERCP using a contrast material mixture of Renografin 60 (40 ml) and gentamicin sulfate (2 ml). The material was injected directly into the pancreatic duct. When the contrast material was seen to extravasate, the injection was terminated. The patient had an uneventful recovery but died six days later due to massive bilateral pulmonary emboli. Postmortem examination revealed a small pancreatic pseudocyst adherent to the posterior wall of the stomach. This case demonstrated the value of ERCP in the preoperative identification of the area of pancreatic duct disruption in patients with pancreatic ascites.

8867 MEDIAL CECAL DEFECT ASSOCIATED WITH METASTATIC PANCREATIC CARCINOMA. *(E.)* Joffe, N. (Beth Israel Hosp. and Harvard Medical Sch., Boston, Mass.). *Radiology* 111(2):297-300, 1974.

The roentgenologic findings in seven patients with a medial extrinsic pressure cecal deformity associated with metastatic pancreatic carcinoma are discussed. One patient had symptoms and signs of intestinal obstruction, while six patients presented with nonspecific abdominal complaints. Of those six, one had a palpable mass, one had ascites, and four had no positive clinical findings. Barium studies performed on six of the seven patients exhibited a similar roentgenologic abnormality, i.e., a localized defect on the medial aspect of the cecum below the ileocecal junction. The cecal mucosa was intact, and small bowel studies were generally normal; barium filling of the appendix was not observed in four patients. The surgical or autopsy findings in all seven cases were similar. There was a primary carcinoma of the pancreas with a prominent metastatic mass in the right lower quadrant adherent to the medial portion of the cecum. In addition, scattered small metastases of the liver, omentum, or peritoneum, and some free i.p. fluid were noted. The association of the primary pancreatic carcinoma with a prominent right lower quadrant mass was suggested to be related to two common modes of pancreatic carcinoma, *via* the mesenteric reflections or by means of i.p. seeding.

8868 ASPIRATION BIOPSY OF CARCINOMA OF THE PANCREAS. *(E.)* Shorey, B. A. (Royal Infirmary, Bristol, England). *Gut* 16(8):645-647, 1975.

Peroperative pancreatic aspiration biopsy was evaluated in 21 patients with pancreatic lesions. The biopsies were performed using a standard 20-ml disposable syringe and a 21-gauge needle. Needle aspirations of the pancreas were also performed on ten postmortem specimens. Of the 21 cases in which biopsies were taken preoperatively, 18 showed malignant cells and in all cases the diagnosis was confirmed either by standard biopsy or at necropsy. Three cases showed no malignancy and subsequent follow-up confirmed its absence in the pancreas. Of the ten cases in which biopsies were performed at necropsy, malignant cells were found in six: four cases were confirmed by metastatic deposits, one was confirmed by further histology, and one was found to be a carcinoma of the stomach which had spread to involve the pancreas. No malignancy was found in the other four cases. The diagnosis of malignancy was made on the basis of irregularity in size, shape, and density of the nuclei, high nuclear cytoplasmic ratio, irregular and large nucleoli, and dense chromatin pattern. The only complication in the series was in a patient who was deeply jaundiced and in whom the jaundice spread to the liver. It is concluded that peroperative pancreatic needle biopsy is a safe and easily performed procedure. It can be of enormous value to the surgeon in planning the treatment of patients with pancreatic lesions and in cases where there is an operable mass in the pancreas. It offers a simple and quick method of determining the presence of malignant cells. In the latter case, definitive surgery may then be performed with confidence. For the inoperable cases, it offers a method of histological confirmation of the operative findings.

8869 ROENTGEN DETECTION OF ENLARGEMENT OF THE BODY AND TAIL OF THE PANCREAS USING THE SUPINE TRANSLATERAL PROJECTION. *(E.)* Seaman, W. B.; Sorabella, P. A.; Campbell, W. L. (Columbia-Presbyterian Medical Center, New York, N.Y.). *Radiology* 111(3):529-533, 1974.

A new method for the detection of enlargement of the body and tail of the pancreas, employing a lateral film using a horizontal beam and a supine patient position, is described. Exposures were made in both full inspiration and full expiration. Three case reports were discussed. In a 45-yr-old man with diagnosed acute pancreatitis, translateral radiographs revealed striking separation of the ligament of Treitz from the gastric fundus, indicating marked enlargement of the pancreatic body and tail. Frontal projections of the duodenal circle were normal, and decubitus laterals were unrevealing. A 58-yr-old woman with known pancreatic disease showed a marked separation of the gastric fundus and the duodeno-jejunal junction in the translateral projection. However, potential misinterpretation of the lateral film was also revealed. Translateral radiographs of a 71-yr-old woman with recurrent acute pancreatitis showed abnormal widening of the space between the gastric fundus and the ligament of Treitz, suggesting pancreatitis. A subsequent radiograph lacked such widening, as well as the localized indentation of the posterior stomach wall previously observed. While the localized indentation is considered a reliable clue to the presence of a retrogastric mass, it cannot reflect the actual size of the lesion. Problems encountered in the interpretation of the translateral technique include the absence of the triangular space between the ligament of Treitz in some patients, the nonparallel long pancreatic axis in the supine patient, and the occasional difficult identification of the ligament of Treitz. However, having been used in over 100 patients, the technique is considered a useful adjunct in suspected pancreatic disease.

8870 THE AXIAL PANCREATIC VIEW: A NEW APPROACH FOR RECOGNIZING ENLARGEMENT OF THE BODY AND TAIL OF THE PANCREAS. *(E.)* Sorabella, P. A.; Campbell, W. L.; Seaman, W. B. (Columbia-Presbyterian Medical Center, New York, N. Y. 10032). *Radiology* 111(3):535-542, 1974.

The technique of employing an axial pancreatic view for detecting enlargement of the pancreatic body and tail is described. The orientation and relationship of the pancreatic body-tail was visualized *via* roentgenographic cadaver experiments, and the axial pancreatic view was developed. Following p.o. administration of 8 oz of barium, the technique consists of placing the patient supine with the left side against a vertical cassette, displacing the foot of the X-ray table at a 25 degree angle, and elevating the left side 20 degrees. A horizontal beam is then directed perpendicularly to the cassette, hence aligned with the long axis of the pancreas. Using the technique, the pancreatic body-tail space was noted to be pathologically enlarged if it could contain a circle 3.5 cm in diameter. The first and second portions of the duodenum were projected posterior to the ligament of Treitz and the posterior gastric wall; hence simplifying identification of the ligament of Treitz. Illustrative clinical case studies demonstrated use of the axial pancreatic view in revealing otherwise obscured large local impressions on the posterior gastric wall and quantitative enlargement of the pancreas. This technique is suggested to be a useful pathological adjunct.

8871 EXOCRINE PANCREATIC FUNCTION AFTER UPPER ABDOMINAL SURGERY. *(E.)* Suda, Y.; Shiraso, M.; Sato, T. (Tohoku Univ. Sch. Medicine, Sendai, Japan). *Tohoku J. Exp. Med.* 115:307-317, 1975.

The exocrine functions of 15 patients who underwent abdominal surgery of several types with external pancreatic duct drainage were compared before and after surgery. Effects of pancreatic or gastric resection and pancreatic fibrosis on the exocrine pancreatic function were studied by histometrical treatment of the tissue and quantitative measurement of pure pancreatic juice. Six patients (5 men and 1 woman, aged 26-52 yr) who underwent cholecystectomy (1 patient) and/or gastrectomy were diagnosed as having cholecystolithiasis and chronic pancreatitis (1), gastric cancer (4) and membranous mucosal folding of the duodenum (1). Five patients (4 men and 1 woman, aged 44-64 yr) who underwent pancreatoduodenectomy were diagnosed as having localized pancreatitis of the head of the pancreas (1), insulinoma of the head of the pancreas (1), cancer of the common bile duct (2) and cancer of the head of the pancreas (1). The daily flow of pancreatic juice in four controls was 833.9 to 958.5 ml. Patients with diverted duodenum showed 60 to 70% depressions in pancreatic secretion when compared to patients with different anastomotic types after subtotal gastrectomy. The difference in secretory response between Billroth I and II gastrectomies was due to the lack in the endogenous duodenal stimulation caused by the diversion of gastric contents. After pancreatoduodenectomy, the secretory depressions in the pancreatic remnant without fibrosis were 31.7% in pancreatic flow, 19.1% in bicarbonate and 11.3% in enzyme output against the control; exocrine pancreatic secretion was depressed beyond the expected value. In two cases of total gastrectomy with the same reconstructive anastomosis, the decreases in pancreatic secretion were about the same as the parenchymal reduction (40%). As the pancreas parenchyma without microscopical lesion occupied 90.47 to 93.97% of the total organ, a pancreas with over 90% parenchyma might be considered functionally normal. The fibrotic pancreas with 70.95% of parenchymal ratio showed a corresponding decrease in the flow of juice and in outputs of bicarbonate and amylase. Exogenous stimulation of secretion with secretin or pancreozymin suggest that the secretory output is affected by the histological changes and the volume of pancreas remnant. The percent increase in enzyme secretion under pancreozymin stimulation was much higher in the nonresected pancreas than in the pancreatoduodenectomized organ.

8872 INCREASE IN URINARY INDICAN EXCRETION IN PANCREATIC STEATORRHOEA FOLLOWING REPLACEMENT THERAPY. *(E.)* Miloszewski, K.; Kelleher, J.; Walker, B. E.; Davies, T.; Smith, C. L.; Losowsky, M. S. (Saint James Hosp., Leeds, England). *Scand. J. Gastroenterol.* 10(5):481-485, 1975.

Urinary indican excretion was studied in five patients with severe steatorrhea of pancreatic origin, in four patients with steatorrhea unrelated to pancreatic insufficiency, and in five normal volunteers. Pancreatic replacement therapy was given *via* 18 Pancrex-V capsules/day. Feces were collected, chromium sesquioxide was used as a continuous fecal marker, and fecal fat was estimated. Urinary indican was measured in 24-hr samples, and considerable variation was noted. In all five patients with steatorrhea of pancreatic origin, indican excretion was found to be in the low normal range initially (10-40 mg/24 hr), then rose significantly to 110 to 220 mg/24 hr. This occurred concurrently with the fall in fecal fat in response to pancreatic replacement therapy. After continuous replacement therapy for 10 to 12 months, indican excretion generally decreased to normal. Pancrex administration plus a low protein diet produced only a small rise in urinary indican excretion, which rose slowly upon reverting to 100 g of daily protein intake. No significant change in indican or fecal fat excretion occurred after pancreatic enzyme therapy in patients with steatorrhea due to causes other than pancreatic insufficiency; minor rises of 10 to 70 mg/24 hr were noted in 80% of the normal subjects. The low indican excretion in pancreatic steatorrhea was assumed to result from inadequate protein digestion. A rise in indican excretion above normal in response to pancreatic therapy seemed specific for steatorrhea of pancreatic origin, and is suggested to be a useful diagnostic test.

8873 ENDOSCOPIC RETROGRADE CHOLANGIOPANCREATOGRAPHY (ERCP) AND PURE PANCREATIC JUICE CYTOLOGY: A COMBINED DIAGNOSTIC APPROACH IN PANCREATIC DISEASE [abstract]. *(E.)* Hatfield, A. R. W.; Smithies, A.; Wilkins, R.; Levi, A. J. (Northwick Park Hosp., Middlesex, England). *Gut* 16(5):405, 1975.

8874 PANCREATIC DIAGNOSIS: COMPARISON OF ENDOSCOPIC PANCREATOGRAPHY (ERCP), ISOTOPE SCANNING, AND SECRETIN TESTS IN 62 PATIENTS [abstract]. *(E.)* Cotton, P. B.; Ponder, B. A. J.; Beales, J. S. M.; Croft, D. N. (Middlesex Hosp., London, England). *Gut* 16(5):405, 1975.

8875 ANTIBODIES REACTING WITH HUMAN EXOCRINE PANCREAS [abstract]. *(E.)* Lendrum, R.; Walker, G. (St. Mary's Hosp., London, England). *Gut* 16(5):405, 1975.

8876 PANCREATIC REGENERATION FOLLOWING SURGICAL RESECTION [abstract]. *(E.)* Pearson, K. W.; Scott, D.; Torrance, H. B. (Manchester R. Infirm., Manchester, England). *Gut* 16(5):405, 1975.

8877 VASOACTIVE INTESTINAL PEPTIDE AND THE VERNER-MORRISON SYNDROME [abstract]. *(E.)* Bloom, S. R. (R. Postgrad. Med. Sch., London, England). *Gut* 16(5):399, 1975.

8878 CHEMICAL COMPOSITION OF PANCREATIC STONES [abstract]. *(E.)* Verine, H. J. (Hosp. Ed. Herriot, Lyon, France). *Gastroenterology* 68(4): 1065, 1975.

8879 COMBINED ENDOSCOPIC PANCREATIC FLUID COLLECTION AND RETROGRADE PANCREATOGRAPHY [abstract]. *(E.)* Kawanishi, H.; Sell, J. E.; Pollard, H. M. (Univ. Michigan Med. Sch., Ann Arbor, Mich.). *Gastroenterology* 68(4):1033, 1975.

8880 SECRETIN STIMULATED SECRETORY PRESSURES IN THE MAIN PANCREATIC DUCT AS MEASURED DURING ENDOSCOPIC CANNULATION [abstract]. *(E.)* Gregg, J. A.; Sharma, M. M. (New England Deaconess Hosp., Boston, Mass.). *Gastroenterology* 68(4):906, 1975.

8881 COMBINED ENDOSCOPIC PANCREATOGRAPHY (EPGM) AND ULTRASONOGRAPHY (USG) FOR THE DIAGNOSIS OF PANCREATIC DISEASE [abstract]. *(E.)* Gregg, J. A.; MacDonald, D.; Gramm, H. (New England Deaconess Hosp., Boston, Mass.). *Gastroenterology* 68(4):906, 1975.

8882 THE EFFECT OF SECRETIN ON PANCREATIC JUICE FLOW RATES DURING ENDOSCOPIC CANNULATION OF THE MAIN PANCREATIC DUCT [abstract]. *(E.)* Gregg, J. A.; Sharma, M. M. (New England Deaconess Hosp., Boston, Mass.). *Gastroenterology* 68(4):905, 1975.

8883 PANCREATIC DUCT LENGTH AND ACINAR CELL FUNCTION IN HEALTH AND PANCREATIC DISEASE [abstract]. *(E.)* DiMagno, E. P.; Hughes, R. W.; Stephens, D. H.; Malagelada, J. R.; King, J. E.; Go, V. L. W. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 68(4):883, 1975.

8884 NUTRITION ASSESSMENT AND MANAGEMENT OF SEVERE ACUTE PANCREATITIS [abstract]. *(E.)* Blackburn, G. L.; Williams, L. F.; Clowes, G. H. A.; Hirsch, I.; Phillips, E.; Gregg, J. (Boston City Hosp., Boston, Mass.) *Gastroenterology* 68(4): 865, 1975.

8885 EVIDENCE THAT THE PANCREATIC FACTOR ENHANCING B_{12} ABSORPTION IS NEITHER TRYPSIN (T) NOR CHYMOTRYPSIN (C) [abstract]. *(E.)* Toskes, P.; Francis, G.; Smith, G.; Sander, E. (VA Hosp., Gainesville, Fla.). *Clin. Res.* 23(3):258A, 1975.

8886 PANCREATIC CEA-LIKE ACTIVITY AND SERUM IN HEALTH AND PANCREATIC DISEASE [abstract]. *(E.)* DiMacno, E. P.; Moertel, C. G.; Go, V. L. W. (Mayo Clin., Rochester, Minn.). *Clin. Res.* 23(3):248A, 1975.

8887 PANCREATIC CYSTS. *(E.)* Campbell, G. (Waikato Hosp., Hamilton, New Zealand). *Practitioner* 214(1284):786-794, 1975.

8888 CYSTIC FIBROSIS. *(E.)* Holzel, A. (Dept. Child Health, Univ. Manchester, Manchester, England). *Practitioner* 214(1284):776-785, 1975.

8889 PANCREATIC AND GASTROINTESTINAL TRAUMA IN CHILDREN. *(E.)* Grosfeld, J. L.; Cooney, D. R. (Indiana Univ. Sch. Medicine, Indianapolis, Indiana). *Pediatr. Clin. North Am.* 22(2):365-377, 1975.

8890 WATERY DIARRHOEA AND HYPOKALAEMIA ASSOCIATED WITH A PHAEOCHROMOCYTOMA. *(E.)* Loehry, C. A.; Kingham, J. G. C.; Whorwell, P. J. (Royal Victoria Hosp., Bournemouth, England). *Postgrad. Med. J.* 51(596):416-419, 1975.

8891 SPONTANEOUS RESOLUTION OF A PANCREATIC PSEUDOCYST BY PERFORATION INTO THE COLON. *(E.)* Khan, T. A. (Dept. Surgery, Univ. Manitoba, Winnipeg, Canada). *Can. J. Surg.* 18(4):349-353, 1975.

8892 SPECIFIC DETECTION OF ABNORMALLY HIGH LEVELS OF PANCREATIC ISOAMYLASE IN URINE [abstract]. *(E.)* Shimamura, J.; Fridhandler, L.; Berk, J. E. (Coll. Med., Univ. California Irvine, Irvine, Calif.). *Clin. Res.* 23(3):256A, 1975.

8893 HYPERAMYLASEMIA ASSOCIATED WITH CANCER: DEMONSTRATION OF AN ANOMALOUS ISOAMYLASE COMPONENT [abstract]. *(E.)* Shimamura, J.; Fridhandler, L.; Berk, J. E. (Coll. Med., Univ. California Irvine, Irvine, Calif.). *Clin. Res.* 23(3): 256A, 1975.

8894 NON-PANCREATIC HYPERAMYLASEMIA IN PANCREATIC CANCER [abstract]. *(E.)* Shimamura, J.; Berk, J. E.; Fridhandler, L. (Coll. Med., Univ. California Irvine, Irvine, Calif.). *Clin. Res.* 23(3):256A, 1975.

8895 BILE SALT KINETICS IN CYSTIC FIBROSIS (CF): INFLUENCE OF PANCREATIC REPLACEMENT [abstract]. *(E.)* Watkins, J. B.; Tercyak, A. M.; Szczepanik, P.; Klein, P. D. (Children's Hosp. Med. Cent., Boston, Mass.). *Gastroenterology* 68(4): 1087, 1975.

8896 THE NEONATAL DIAGNOSIS OF CYSTIC FIBROSIS. *(Fr.)* Feigelson, J. (No affiliation given). *Pediatre* 11(50):53-54, 1974.

8897 RELATED MORPHOLOGICAL CHANGES OF THE PANCREAS IN NON-PANCREATIC DISEASES. *(Ger.)* Becker, V. (Pathologischen Inst., Univ. Erlangen-Nurnberg, Erlangen, Germany). *Inn. Med.* 1(2):122-130, 1974.

8898 INTRAPANCREATIC GROWTH AND INFILTATION OF MALIGNANT TUMOR ARISING IN THE PANCREAS. *(Jpn.)* Koizumi, T.; Nakase, A. (Kyoto Univ. Medicine Sch., Kyoto, Japan). *Arch. Jpn. Chir.* 43(5):373-378, 1974.

8899 GALLBLADDER ANOMALIES IN CYSTIC FIBROSIS: 57 CASES. *(Fr.)* Feigelson, J.; Mareschal, J. L.; Sauvegrain, J. (37, rue Navier, 75017 Paris, France). *Med. Chir. Dig.* 4(2):121-124, 1975.

8900 PANCREATIC CARCINOMA IN RATS: IMPLANTATION EXPERIMENT. *(Ger.)* Klemm, G.; Mehnert, W. H. (Klinik Innere Medizin, Ernst-Heydemann-Strasse, Rostock, Germany). *Z. Gesamte. Inn. Med.* 30(13):452-454, 1975.

8901 INTERRUPTION OF THE ENTEROHEPATIC CIRCULATION (EHC) OF BILE ACIDS (BA) IN CYSTIC FIBROSIS (CF) [abstract]. *(E.)* Weber, A. M.; Roy, C. C.; Lepage, G.; Chartrand, L.; Lasalle, R. (Hosp. St.-Justine, Montreal, Quebec, Canada). *Gastroenterology* 68(4):1066, 1975.

See also, 8418, 8427, 8441, 8443, 8455, 8458, 8648, 8850, 8902, 8918, 8919, 8942, 9023, 9031, 9146, 9271, 9302, 9305, 9328, 9354.

PANCREAS

Pancreatitis

8902 ENDOSCOPIC PANCREATOGRAPHY: AN ANALYSIS OF THE RADIOLOGIC FINDINGS IN PANCREATITIS. *(E.)* Robbins, A. H.; Messian, R. A.; Widrich, W. C.; Paul, Jr., R. E.; Norton, R. A.; Schimmel, E. M.; Ogoshi, K. (Tufts Univ. Sch. Medicine, Medford, Mass. 02155). *Radiology* 113(2):293-296, 1974.

An analysis of the roentgenological findings in pancreatitis using endoscopic pancreatography is presented for 46 patients with either strong clinical criteria for diagnosis or subsequent surgical proof of pancreatitis. Patients were sedated with 2 to 20 mg of diazepam, i.v., and the endoscope was introduced into the duodenum. Then 5 to 10 mg of propantheline bromide was given, i.v., to induce duodenal hypotonia. A Teflon cannula (1.7 mm O.D.) was then passed through the endoscope into the ampulla of Vater. Two to three ml of Renograffin-60 was injected through the cannula for visualization of the pancreatic duct and 15 ml was used to visualize the biliary tree. Fluoroscopic spot films were then obtained. The results were as follows: 41.3% showed a normal system; 4.3% showed minimal changes; 30.4% showed moderate changes and 24% showed marked changes. Minimal changes included irregularity, dilatation, and stenosis in the duct branches. Moderate changes were tortuosity, dilation, and minimal to moderate stenosis of the pancreatic duct. Marked changes included obstruction, cyst formation, or calculi plus moderate changes in the main pancreatic duct. There was no correlation of duration of disease with severity of pathologic changes. It is suggested that endoscopic pancreatography may be a useful adjunct for confirming diagnosis and defining pathology of pancreatic disease, and may also be used to determine the surgical procedure required by defining the pathologic anatomy. It also provides visualization of the pancreatico-biliary tree in a greater majority of cases than conventional invasive and non-invasive means.

8903 PROMINENT FOLDS ON THE POSTERIOR WALL AND LESSER CURVATURE OF THE STOMACH: A SIGN OF ACUTE PANCREATITIS. *(E.)* Balthazar, E.; Henderson, M. (Metropolitan Hosp. Center, New York, N.Y.). *Radiology* 110(2):319-321, 1974.

The diagnostic reliability of localized irregularities of the posterior wall and/or lesser curvature of the stomach as a sign of acute pancreatitis was determined. The mucosa was visualized in the barium-filled stomachs of 38 patients with acute pancreatitis. Abnormalities of the upper gastrointestinal tract occurred in 74% of the cases and duodenal sweep changes occurred in 16 of 38 cases. A marked irregularity of the posterior wall and/or lesser curvature was observed in eight cases, three of whom had no other gastrointestinal abnormalities. The selective prominence of the gastric rugal folds depended on the time elapsed since the clinical onset of the disease; rugal prominence disappeared as the symptoms subsided. A direct correlation was observed between the intensity of the inflammatory process and the presence of the folds. Thus, selective rugal prominence may serve as a reliable and frequent sign of acute pancreatitis. Recognition and correct interpretation of irregularities of the posterior wall and/or lesser curvature will help to establish a correct diagnosis.

8904 PANCREATIC ENCEPHALOPATHY: THE DIFFICULTY AND IMPORTANCE OF DIAGNOSIS. THREE CASES. *(Fr.)* Aubert, P.; Lainee, J.; Duron, F.; Reboul, M. (Hôpital Paul-Brousse, 94800 Villejuif, France). *Rev. Fr. Gastroenterol.* (103):7-20, 1974.

The polymorphism of the neuropsychic manifestations accompanying pancreatitis was studied in three cases where a pancreatic encephalopathy (PE) was suspected. In case one, acute hallucinatory delirium with muscular hypertonia was reported in a 39-yr-old male. The usual treatment for delirium tremens was inefficient. Clearing of the delirium occured after a treatment with anti-enzymes, and calcifying pancreatitis was discovered. The second case (a 69-yr-old male) was a chronic alcoholic, and was suffering from choledocholithiasis, pancreatitis, cytosteatonecrosis and PE. The third patient had been hospitalized for an episode of epileptic seizure, a hyperglycemia accompanied by acute abdominal syndrome with melena, cecal necrosis, chronic pancreatitis and hemorrhagic suffusion; he died two days after surgery. The frequency of PE was difficult to assess as was the time of onset of the neuropsychological symptoms in relation to the pancreatitis *per se*, although these factors seemed to be subordinate to it. The psychological signs of PE were: mental confusion, disorientation, psychomotor agitation, and delirium with visual hallucination. The neurological signs, such as muscular hypertonia, were not always present. An important diagnostic tool was recognition of increased amylase levels in the blood and urine. The mechanism for PE remains unknown; however, it is suggested that the pancreatitis may liberate elements into the vascular system which irritate the nervous system. It is suggested that these elements may be trypsin and lipase.

8905 CHRONIC PANCREATITIS AND ALPHA-1-ANTITRYPSIN. *(E.)* Novis, B. H.; Young, G. O.; Bank, S.; Marks, I. N. (Grote Schuur Hosp., Cape Town, South Africa). *Lancet* 2(7938):748-749, 1975.

The prevalence of the various Pi phenotypes of α_1-antitrypsin was determined in 110 patients with chronic pancreatitis and compared with that in 116 blood donors. Alcohol was considered the cause of the chronic pancreatitis in 98 patients; the other 12 had idiopathic pancreatitis. Serum α_1-antitrypsin levels were measured by immunodiffusion and the pattern of the Pi phenotype was determined by acid starch-gel electrophoresis. The PiMM phenotype was significantly less common in the patients with pancreatitis (70%) than in the controls (87%), while the PiMZ phenotype (including Mweak) was significantly more prevalent in the patients (9%) than in the controls (0%). The MS phenotype was also more frequent in patients with chronic pancreatitis (16%) than in controls (10%), but the difference was not significant. Thirty-one of the 33 patients with a Pi phenotype other than MM had evidence of pancreatic calcification, and 21 had grossly deficient pancreatic exocrine function. Alcohol was implicated in 29 of these 33 cases. The decreased frequency of the PiMM phenotype and the greater frequency of the PiMZ in the patient group suggests an association between heterozygous α_1-antitrypsin deficiency and chronic pancreatitis. This deficiency might render the pancreas more vulnerable to the effect of alcohol or other etiological agents, or it might result in the pancreas being less able to combat the destructive effects of trypsin and other proteolytic enzymes during an acute attack.

8906 ELASTASE LEVELS DURING BILE-INDUCED PANCREATITIS IN DOGS DETERMINED BY RADIOIMMUNOASSAY. *(E.)* Kasahara, K.; Carballo, J. R.; Takada, Y.; Appert, H. E.; Howard, J. M. (Medical Coll. Ohio, Toledo, Ohio). *Surg. Gynecol. Obstet.* 141(3):347-351, 1975.

By using the new method of radioimmunoassay, the changes in elastase levels were studied in the plasma and ascitic fluid before and after bile-induced pancreatitis in ten mongrel dogs. The dogs were fasted overnight. Under pentobarbital sodium-induced anesthesia, the femoral vein was exposed and cannulated for infusion of Ringer's lactated solution, maintenance of anesthesia and drawing of blood samples. A polyvinyl cathether was inserted in a cephalic direction through a branch of the pancreaticoduodenal vein. The catheter was connected to the infusion set filled with heparinized Ringer's solution. The caudal pancreaticoduodenal vein was ligated and divided, but the caudal pancreatic arteries were maintained intact to preserve the blood supply of the right lobe. The vascular connections between the pancreas and the duodenum were ligated. The right gastroepiploic vein also was ligated. The gastroduodenal vein was exposed immediately proximal to the point at which the right gastroepiploic vein joins it. A snare passed around the vein at this point was used to occlude the vein at the time when blood samples were drawn through the catheter. To inject the entire pancreas with bile, the tip of the Teflon (polytetrafluoroethylene) tube (inserted through the duodenal opening) was located immediately proximal to the bifurcation of the duct. Heparinized blood samples were drawn from the pancreatic and the femoral vein at intervals of 15, 30 and 45 min as well as 1, 2, 3, and 5 hr after the beginning of the injection of the bile. Ascitic fluid was collected as completely as possible at 30 min, 1, 2, 3, and 5 hr after the beginning of the bile injection. Total elastase activity was measured after activation of proelastase by the addition of 5 mg of trypsin. Free elastase activity was measured in the presence of 500 U of Trasylol (aprotinin) which prevents the possibility of activation of proelastase by trypsin. Although the amylase and lipase levels increased markedly, there was no significant increase in the plasma elastase levels. On the other hand, the elastase levels of the blood in the femoral and pancreatic veins, as measured by radioimmunoassay, increased about ten times above the control levels. Similarly, in pancreatitis, large amounts of elastase, determined by radioimmunoassay, were found in the ascitic fluid. At that time, no elastase activity could be determined in the ascitic fluid using a fluorometric method. In this study, it is suggested that circulating inhibitors interfere with the determination of elastase enzymatic activity but do not interfere with the radioimmunoassay of elastase. At the present time, however, it has not been determined whether elastase inhibitor in ascites is the same as that in serum.

8907 THE PROTEOLYTIC PROENZYMES IN THE PERITONEAL EXUDATE DURING ACUTE EXPERIMENTAL PANCREATITIS OF THE RAT. *(E.)* Huttunen, R. (Dept. Anatomy, Univ. of Oulu, Oulu, Finland). *Acta Chir. Scand.* 141(4):285-288, 1974.

The presence of precursors of proteolytic enzymes in the peritoneal inflammatory exudate of rats with acute experimental pancreatitis was investigated. Activation of proenzymes from exudate and plasma fractions was performed using enterokinase (2 mg/ml) and trypsin (0.4 mg/ml). The N-alpha-benzoyl-DL-arginin-4-nitroanilid-hydrochlorid (BAPNA), succinyl-L-phenylalanine-*p*-nitroanilide (SUPHEPA), and N-acetyl-L-tyrosine ethyl ester (ATEE) hydrolysate activities were determined along with trypsin-inhibiting capacity (TIC). Protein content of gel filtration fractions was performed spectrophotometrically at 280 nm. Proteolytic activities, proenzymes and proteinase-inhibiting factors were studied from the fractions obtained by Sephadex G-200 gel filtration. The first BAPNA-hydrolysis activity was demonstrated with and without enterokinase activation. The latter peak of BAPNA-hydrolysis activity, eluted after main protein and TIC, required enterokinase incubation. No BAPNA activity was found within control exudate fractions. Trypsin activation was found in the exudates obtained during pancreatitis, but not in control exudates. The activated enzymes were able to hydrolyze BAPNA, ATEE, and SUPHEPA. The minimal enzyme activation times with enterokinase varied with substrate studied: BAPNA, one hr; ATEE, 15 min; and two hr for SUPHEPA. The maximum time needed for highest activity varied from 10 to 30 hr. The proenzymes could be separated from inhibitors by gel filtration indicating that the enzyme-inhibitor complex formation is enzymatically-mediated. These results demonstrate, qualitatively, the presence of enzyme precursors in inflammatory peritoneal exudate during pancreatitis. The absence of enzyme precursors from the exudate of induced-peritonitis, suggests that the proenzymes present in the exudate of pancreatitis are of pancreatic origin.

8908 RELEASE OF PROTEOLYTIC ENZYMES IN BILE-INDUCED PANCREATITIS IN DOGS. *(E.)*

Ohlsson, K.; Eddeland, A. (Malmö General Hosp., S-214-01 Malmö, Sweden). *Gastroenterology* 69(3): 668-675, 1975.

The trypsin, chymotrypsin, elastase α_1-antitrypsin, and α_2-macroglobulin levels were measured in the pancreatic exudate, ascitic fluid, thoracic lymph, and plasma following the injection of bile (0.5 ml/kg) into the pancreatic ducts of fasted, anesthetized mongrel dogs of both sexes. Bile injection was followed by a fall in the mean arterial pressure to 45 to 60% of the control values; the pressure then returned to almost normal levels before the ultimate drop. All animals died 5 to 12 hr after bile injection. Autopsy revealed severe hemorrhagic pancreatitis with severely damaged pancreatic glands; the hematocrit of the femoral venous blood was increased 20 to 35% and the amylase activity was increased seven-fold. The initial fall in blood pressure was accompanied by the appearance of large quantities of active trypsin, chymotrypsin, and elastase in the pancreatic exudate, with full saturation of protease inhibitors. The ascitic fluid, lymph, and plasma showed lower peak concentrations and progressively lower rises in enzyme content. The enzymes in the ascitic fluid and lymph appeared only in the form of complexes with α_1-antitrypsin and α_2-macroglobulin. No such complexes were detected in the venous blood, indicating short half-life in the circulation. The results show that proteolytic enzymes of the pancreas are released in active form in bile-induced pancreatitis, thus supporting the concept of autodigestion in pancreatitis. More detailed immunochemical studies with antisera specific for human pancreatic proteases and plasma protease inhibitors should prove rewarding in studies of acute pancreatitis in man.

8909 CHRONIC PANCREATITIS, ALCOHOLIC LIVER CIRRHOSIS AND SALIVARY SECRETION. *(E.)*

Minaire, Y.; Descos, L.; Lambert, R. (Hopital Edouard-Herriot, Lyon, France). *Digestion* 12(1):57-60, 1975.

A study was conducted to determine if an alteration in salivary secretion accompanied exocrine pancreatic secretion in chronic pancreatitis (CP) and in alcoholic liver cirrhosis (ALC). Saliva was examined in 14 patients with CP, in nine with ALC and in 13 controls. All patients with CP had histories of substantial alcohol consumption. Basal saliva was aspirated through a dental sucking tube, saliva stimulation was performed by chewing parafilm followed by expectoration into a collection bottle. Measurements of volume, bicarbonate, chloride and amylase content were performed on 15-min samples. Both CP and ALC caused a reduction in basal saliva volume (ml/15 min). The values were: control, 16.9; CP, 10.4; and 9.4 for ALC. For bicarbonate the values were: control, 8.6 mM; CP, 6.2 mM; and 3.3 mM for ALC. The chloride values were: control, 17.7 mM; CP, 23.5 mM; and 20.1 mM for ALC. Amylase concentration values were: control, 7.0 (Lagerl U); CP, 6.4; and 3.2 for ALC. The differences compared to controls were significant for volume, bicarbonate and amylase outputs in CP and for all parameters in ALC. The chloride concentration in the stimulated saliva of CP patients was significantly different from the control value. This difference was interpreted as being due to decreased canalicular reabsorption. These results show that salivary changes due to CP or ALC are not glandular-mediated directly but are due to large alcohol consumption, which causes a decreased sensitivity through nervous control rather than affecting secretory capacity.

8910 MASSIVE ASCITES ASSOCIATED WITH PANCREATITIS: REVIEW BASED ON 10 CASES. *(Fr.)*

Geffroy, Y.; Colin, R.; Testart, J.; Bourreille, J.; Ledouarec, P.; Paillot, B.; Joram, F. (Hôpital Charles Nicolle, 76038 Rouen Cedex, France). *Sem. Hop. Paris* 51(14):927-934, 1975.

Massive ascites associated with pancreatitis was investigated in ten patients (mean age 35 yr) and the results were compared to 100 similar cases taken from the literature. Massive ascites appeared as a rare complication in pancreatitis. Alcoholism was concurrent in 70% of the cases. Some ascites occurred after abdominal trauma, some after an already diagnosed pancreatitis, and in the majority of patients, ascites was present before the onset of pancreatitis. The color of the ascitic liquid varied from a light yellow to a dark pink. The clinical signs were those of pancreatitis in addition to peritoneal effusion. Temperature elevation and abdominal pain were common symptoms. Associated lesions resulted in pleural and pericardial effusion, as well as cutaneous, vascular and neuropsychiatric syndromes. Titration of pancreatic enzymes proved essential for diagnosis. Amylase, lipase, and eosinophil levels were often elevated. Blood tests revealed high levels of amylase, leukocytes, and albumin. Ascites were formed by (1) a loss of pancreatic fluid through a breach in the pancreas and (2) peritonitis. A cure for the ascites can be obtained through fluid drainage during exploratory laparotomy or through surgical drainage by a gastropancreatic anastomosis.

8911 MARKED HYPERVASCULARITY AND ARTERIOVENOUS SHUNTING IN ACUTE PANCREATITIS. *(E.)*

Roe, M.; Greenough, W. G. (Baylor Univ. Medical Center, Dallas, Texas 75246). *Radiology* 113(1):47-48, 1974.

Angiographic findings in a single case with acute pancreatitis were reported. A 50-yr-old male was admitted with a six month history of epigastric pain and back discomfort unresolved by antacids or anticholinergic drugs. Physical exam revealed slight tenderness on deep epigastric palpitation. Oral cholecystography, cine-esophagography, serum lipase and amylase, urine amylase (24 hr), barium enema, gastric acid analysis, electrocardiogram, and serum electrolytes were all negative. Gastroscopy revealed inflammation in the duodenum and prepyloric gastric antrum. Gastritis was diagnosed and the patient was released. Upon readmission due to increased epigastric pain, serial chemistry showed elevated bilirubin, SGOT, and alkaline phosphatase levels. Fasting blood sugar, BUN, electrolytes and three blood cultures were negative. Abdominal arteriography (initial aortic flush) showed pancreatic staining. Selective injections revealed intense pancreatic hypervascularity and arteriovenous shunting with early mesenteric and portal venous filling. The differential diagnosis included: pancreatitis, diffuse neoplasm, cystadenoma, angiosarcoma, cavernous hemangioma and hemangioendothelioma. A pancreatic biopsy revealed obstruction of the common and pancreatic ducts by a hamartoma, 3 x 4 x 8 cm, in the ampulla of Vater. Cholecystectomy was performed due to the presence of an adenomyoma. It is concluded that diagnosis of pancreatitis by angiography is difficult due to variability in the extent of hypovascularity, hypervascularity or enlargement of the pancreas.

8912 JUVENILE CALCIFYING CHRONIC PANCREATITIS OF ISCHEMIC ORIGIN? *(Fr.)*

Le Bras, M.; Langlois, J.; Renambot, J.; Lamouche, P.; Renaud, A.; Bertrand, E. (Chaire de Clinique Medicale, C.H.U., Abidjan, Cote d' Ivoire). *Arch. Fr. Mal. App. Dig.* 63(8):639-644, 1974.

A 12-yr-old black African boy was admitted to the hospital suffering from prolonged and recurrent epigastric pains of no definite origin. Chronic calcifying pancreatitis was demonstrated radiologically. No exocrine pancreatic insufficiency, diabetes or malnutrition accompanied the pancreatitis. Abuse of alcohol was also inapplicable. Bilharzia as a cause was discarded for three reasons: (1) the boy did not live in an area where bilharzia was endemic, (2) the rectal biopsy of the mucous membrane was negative and (3) the specific immunologic serology was also negative. Ascariasis and eosinophilia were not suspected. If it were a case of hereditary pancreatitis, then each generation would be afflicted, transmission being autosomic and dominant; this was not the case. No hyperlipidemia was present. No traumatic or infectious episode preceded the pancreatitis. Antigen Au was negative. The following led to the diagnosis of ischemic calcific chronic pancreatitis: (1) vascular abnormalities of congenital origin, (2) no celiac trunk, (3) the hepatic artery and the left gastric artery derived directly from the aorta, (4) the splenic artery shot out from the superior mesenteric artery and (5) no gastro-duodenal artery nor pancreaticoduodenal arches were present. Hence, the poor vascularization of the pancreas could be the cause, as well as the consequence of this disease.

8913 PANCREATITIS WITH VIRAL HEPATITIS AND HEPATIC COMA. *(Ger.)*

Lankisch, P. G.; Rahlf, G.; Schmidt, H.; Creutzfeldt, W. (Med. Clin., Univ. Gottingen, Germany). *Z. Gastroenterol.* 13 (3):407-412, 1975.

Clinical and pathological evidence is presented which suggests that the common viral etiology of acute pancreatitis and fulminant hepatitis does not account for the frequent association of acute pancreatitis with hepatic coma. Serum and urinary amylase activities, determined for 35 patients with viral hepatitis (20 hepatitis B antigen-positive and 15 hepatitis B antigen-negative), were all within the normal range. These patients had clinical courses which varied in severity and included three with hepatic coma and two with precoma. A retrospective study was performed on 85 autopsied patients who had died in hepatic coma. These consisted of (1) 22 patients with acute hepatic necrosis (of viral etiology in 20 cases and halothane-induced in 2); (2) eight patients with subacute hepatic necrosis of viral etiology; and (3) 55 patients with cirrhosis. Acute pancreatitis was present in 5 of the 30 with acute or subacute hepatic necrosis (16.7%) and in 10 of the 55 with cirrhosis (18.2%). Of the five patients with hepatic necrosis and acute pancreatitis, four had been given steroids, two were alcoholics, three had biliary disease, one had undergone cholecystectomy for cholelithiasis (the common bile and pancreatic ducts had a common outlet), and two patients had gastric bleeding. One other patient had localized pancreatic fibrosis. In the ten patients with cirrhosis, pancreatitis was less severe than in those with hepatic necrosis. Fatty necrosis of the pancreas was the most common finding in cirrhotics; seven other patients had localized pancreatic fibrosis. Of the patients with cirrhosis and pancreatitis, eight had massive gastric bleeding, four had undergone shunt surgery, two had biliary disease, two had thrombosis of the portal vein, and one had a duodenal diverticulum in the papilla of Vater. Pancreatitis was diagnosed only at autopsy in all patients who died of hepatic coma.

8914 OSTEOMALACIA AND CHRONIC PANCREATITIS. *(Fr.)*

Prost, A.; Hanniche, M.; Bordier, P.; Miravet, L.; de Seze, S.; Rambaud, J. C. (Service de Medecine generale et de Rhumatologie Hopital Saint-Jacques 85, rue Saint-Jacques, F 44035 Nantes, France). *Nouv. Presse Med.* 4(21):1561-1566, 1975.

A new digestive etiology is reported for osteomalacia (OM) and chronic pancreatitis (CP). OM patients could not hydrolyze the triglycerides necessary to solubilize vitamin D_3. Five patients among the 44

OM patients investigated also suffered from CP. In two cases, the diagnosis of CP was 6 to 12 yr after that of OM. The observed CP was always calcifying. CP was linked to chronic alcoholism and steatorrhea. All patients presented with an associated factor which could have triggered the onset of OM and CP such as: alcoholic cirrhosis, gastrectomy with gastrojejunal anastomosis, blind loop syndrome, primary hyperparathyroidism or a long history of anticonvulsive drug treatment. The associated factors could have worsened the vitamin deficiency through anorexia, increased malabsorption of vitamin D, defective activation of vitamin D (as in cirrhotics) or increased vitamin demand by absorption of anticonvulsive drugs. It is concluded that exocrine pancreatic insufficiency does not induce OM *per se*.

8915 ETIOLOGY OF STRICTURES OF THE COLON ASSOCIATED WITH PANCREATITIS. *(E.)* Hunt, D. R.; Mildenhall, P. (St. George Hosp., Kogarah, 2217, New South Wales, Australia). *Am. J. Dig. Dis.* 20(10):941-946, 1975.

Only 13 cases of colonic strictures associated with pancreatitis have been reported in the literature. Three new cases were described in which the histologic features strongly resembled those seen in strictures of ischemic origin. Ischemic colitis was suspected in a 65-yr-old man and, although initial findings suggested transient (mucosal) ischemic colitis, laparotomy revealed progression to the gangrenous stage. The association with pancreatitis was not recognized until postmortem examination, but the presence of thickening of the transverse mesocolon and splenic pedicle was noted at laparotomy. The stricture extended from the distal transverse colon to the descending colon. A 63-yr-old man and a 52-yr-old woman both developed strictures in the colon after pancreatitis. In the former, a mass in the tail of the pancreas was adherent to the greater curvature of the stomach and splenic flexure of the colon. The stricture in the third patient was just distal to the splenic flexure. In each of these three cases the mucosa was intact, but there was submucosal fibrosis and/or submucosal vessel thrombosis, hemosiderin-laden macrophages, granulation tissues, and muscle necrosis. The presence of hemosiderin-containing macrophages and evidence of submucosal vessel thrombosis are diagnostic features of ischemic damage, and indicate that narrowing of the colon is due to changes in the bowel wall and not to extraluminal compression. It is postulated that ischemia, and not encircling pericolic inflammation, is the cause of strictures associated with pancreatitis.

8916 ACUTE PANCREATITIS: A PROSPECTIVE STUDY AND SOME FACTORS IN MORTALITY [abstract]. *(E.)* Imrie, C. W.; Frew, E. M. S.; Jones, W. L.; Blumgart, L. H. (Glasgow R. Infirm., Scotland). *Gut* 16(5):406, 1975.

8917 ACUTE PANCREATITIS IN NOTTINGHAM 1969-1973: A RETROSPECTIVE VIEW [abstract]. *(E.)* Bourke, J. B. (Univ. Nottingham, Dept. Surg., England). *Gut* 16(5):405-406, 1975.

8918 CARCINOEMBRYONIC ANTIGEN AND CYTOLOGY OF PANCREATIC FLUID [abstract]. *(E.)* Kawanishi, H.; Sell, J. E.; Pollard, H. M. (Univ. Michigan Med. Sch., Ann Arbor, Mich.). *Gastroenterology* 68(4):923, 1975.

8919 ENZYMATIC ANALYSIS OF PURE PANCREATIC JUICE (PPJ) OBTAINED DURING THE ENDOSCOPIC CANNUALTION OF THE MAIN PANCREATIC DUCT (ECMPD) [abstract]. *(E.)* Gregg, J.; Sipos, T.; Sharma, M.; Gibbons, G.; Whalen, M.; Blackburn, G. (New England Deaconess Hosp., Boston, Mass.). *Gastroenterology* 68(4):904, 1975.

8920 AMPICILLIN THERAPY IN ACUTE PANCREATITIS [abstract]. *(E.)* Craig, R. M.; Dordal, E.; Kravitz, A. (Northwestern Univ. Med. Sch., Chicago, Ill.). *Gastroenterology* 68(4):878, 1975.

8921 REMOTE RESULTS OF SURGICAL TREATMENT OF CHRONIC PANCREATITIS. *(Rus.)* Trunin, M. A. (Faculty Clinic Surgery, Leningrad Sanitary Hygiene Medical Inst., USSR). *Khirurgiia (Mosk.)* (1):107-115, 1975.

8922 EFFECT OF LIOBYL ON THE EXCRETORY FUNCTION OF THE LIVER AND THE PANCREAS IN PATIENTS WITH CHRONIC CHOLECYSTO-PANCREATITIS AND WITH POSTCHOLECYSTOECTOMIC SYNDROME. *(Rus.)* Bereza, N. M. (Dept. Hepatic Pancreatic Diseases, Dnepropetrovsk Scientific Res. Inst. Gastroenterology, USSR). *Ter. Arkh.* 41(12):84-87, 1974.

8923 PROFUSE HAEMORRHAGES IN PANCREONECROSIS. *(Rus.)* Forafonova, I. N. (Dept. Hosp. Surgery, Aktyubinsk Medical Inst., USSR). *Khirurgiia (Mosk.)* (1):99-103, 1975.

8924 RESULTS OF SURGICAL TREATMENT OF CHRONIC PANCREATITIS. *(Rus.)* Sokolov, V. I.: Novgorodskaya, T. I.; Movchun, A. V. (All Union Scientific Res. Inst. Clinical Experimental Surgery, USSR). *Khirurgiia (Mosk.)* (1):103-107, 1975.

8925 COMPARATIVE EVALUATION OF TREATMENT OF ACUTE PANCREATITIS WITH ANTIENZYME AGENTS. *(Rus.)* Synovets, A. S.; Dekhtiar, A. L.; Khudoley, I. F. (Dept Surgery Therapeutic Faculty, N. I. Pirogov Odessa Medical Inst., USSR). *Klin. Khir.* (2):22-26, 1975.

8926 RETROSPECTIVE ANALYSIS OF 111 CASES OF PANCREATITIS. *(Sp.)* Lieberman, M.; Ganem, G.; Fiqueroa, J. A. (Hospital de Oncologia del Centro Medico Nacional, Instituto Mexicano del Seguro Social, Mexico). *Rev. Med. Inst. Mex. Seguro Soc.* 13(3):204-212, 1974.

8927 FAMILY PANCREATITIS AND MUCOVISCIDOSIS. *(Fr.)* Hardy, M.; Lenne, Y. (No affiliation given). *Bordeaux Med.* 8(7):785-787, 1975.

8928 PANCREATITIS IN CHILDREN. A STUDY IN THE NORTH OF ENGLAND. *(E.)* Sibert, J. R. (Dept. Child Health, Univ. Newcastle upon Tyne, England). *Arch. Dis. Child.* 50(6):443-448, 1975.

8929 THE EFFECTS OF ISOPROTERENOL AND 1-NOREPINEPHRINE IN THE TREATMENT OF BILE-INDUCED HEMORRHAGIC PANCREATITIS IN DOGS [abstract]. *(E.)* Cazen, R.; Kerstein, M.D. (Yale Univ. Sch. Med., West Haven, Conn.). *Clin. Res.* 23(3):247A, 1975.

8930 FRACTIONATION OF SALIVARY (AMY$_1$) AND PANCREATIC (AMY$_2$) AMYLASE IN HYPERAMYLASEMIC PATIENTS [abstract]. *(E.)* Ward, J. C.; Lehrner, L. M.; Karn, R. C.; Merritt, A. D. (Indiana Univ. Sch. Med., Indianapolis, Ind.). *Clin. Res.* 23(3):260A, 1975.

8931 THE DEGREE OF PARALLELISM IN THE SECRETION OF PANCREATIC ENZYMES IN HEALTHY INDIVIDUALS AND IN PATIENTS WITH CHRONIC PANCREATITIS ANALYZED BY USING PANCREOZYMIN. *(Rus.)* Geller, L. I.; Bulgakova, O. S. (Dept. Hosp. Ther. Khabarovsk Med. Inst., USSR). *Vopr. Pitan.* (2):40-42, 1975.

8932 GASTROINTESTINAL HEMORRHAGES DURING ACUTE PANCREATITS. *(It.)* Gianpaglia, F.; Cecere, C.; Fraioli, G. (2nd Med. Surg. Fac., Univ. Naples, Italy). *Rass. Int. Clin. Ter.* 54(23):1407-1412, 1974.

8933 THE PLACE OF SURGERY IN THE TREAMENT OF PRIMARY CHRONIC PANCREATITIS. *(Fr.)* Poilleux, J.; Lichtenstein, H. (St. Antoine Hosp., Paris, France). *Concours Med.* 97(9):1416-1426, 1975.

8934 COMPARATIVE CHARACTERISTICS OF THE THERAPEUTIC EFFECT OF PROTEASE INHIBITORS IN ACUTE PANCREATITIS. *(Rus.)* Khudolei, I. F. (Odessa Medical Inst., USSR). *Vrach. Delo* (4):25-28, 1975.

8935 ACUTE PANCREATITIS AND PANCREATIC NECROSIS. *(Ger.)* Zastrow, R. (Klinik Innere Medizin, Universitat Rostock, Germany). *Z. Aerztl. Fortbild.* 69(8):410-412, 1975.

8936 ACUTE HEMORRAGIC PANCREATITIS IN CHILDREN. *(It.)* Cannavo, A. (Ospedale S. Marta e S. Venera in Acireale, Italy). *Osp. Ital. Chir.* 27(2-3): 103-108, 1974.

8937 ACUTE PANCREATITIS. *(It.)* Docimo, R.; Masella, A. (Facolta de Medicina e Chirurgia, Univerista de Napoli, Napoli, Italy). *Rass. Int. Clin. Ter.* 55(5):255-265, 1975.

8938 NOTES ON ACUTE PANCREATITIS FOLLOWING BILE DUCT SURGERY. *(It.)* Bergamaschi, R.; Dallari, A.; Morini, C.; Melotti, G. (Surgical Div., Modena Hosp., Modena, Italy). *Chirurgia* 36(66):1720-1725, 1975.

8939 BLOOD TRYPSIN IN ACUTE PANCREATITIS. *(It.)* Casolaro, M.; De Simone, E.; Vella, M. (Ospedaliero Regionale Generale, Naples, Italy). *Rass. Int. Clin. Ter.* 55(7):390-393, 1975.

8940 THE ACUTE PANCREATITIS IN CHILDREN. *(It.)* Bartoli, G. C.; Cappello, S. E. (Ospedaliero Regionale Specializzato, Napoli, Italy). *Rass. Int. Clin. Ter.* 55(5):266-275, 1975.

8941 ACUTE PANCREATITIS. *(Fr.)* Hureau, J. (Hopital Vaugirard, 75015 Paris, France). *Med. Chir. Dig.* 4(2):99-108, 1975.

8942 INTRAPERITONEAL LIPASE AND TRYPSIN IN EMERGENCY ABDOMINAL SURGERY: INTERPRETATION OF THEIR ACTIVITIES IN PERITONEAL FLUID OBTAINED BY PARACENTESIS WITH OR WITHOUT LAVAGE. *(Fr.)* Tamarelle, C.; Perissat, J.; Saric, J.; Doutre, L. P. (Clinique Chirurgicale A., 311 Bl du President-Wilson, 33200 Bordeaux, France). *Med. Chir. Dig.* 3(5):331-335, 1974.

8943 PERIPANCREATIC CLEANSING BY RETROPERITONEAL DIALYSIS: AN ADJUNCT TO SURGERY FOR ACUTE NECROTIZING PANCREATITIS. *(Fr.)* Vankemmel, M. (Cite Hospitaliere, 59000 Lille, France). *Med. Chir. Dig.* 4(2):113-119, 1975.

8944 PERFORATIONS OF ACCESSORY BILE DUCTS IN THE COURSE OF ACUTE PANCREATITIS. *(Fr.)* Combe, J.; Milleret, P. (Clinique Chirurgicale Universitaire, C.H.R. Besancon, France). *Med. Chir. Dig.* 4(2):109-112, 1975.

See also, 8215, 8377, 8423, 8428, 8431, 8821, 8869, 8870, 8874, 8875, 8879, 8880, 8881, 8882, 8883, 8886, 8892, 9023, 9270, 9272.

8945 ANGIOGRAPHIC FINDINGS IN BENIGN LIVER CELL TUMORS. *(E.)* Goldstein, H. M.; Neiman, H. L.; Mena, E.; Bookstein, J. J.; Appleman, H. D. (Univ. Michigan Medical Center, Ann Arbor, Mich.). *Radiology* 110(2):339-343, 1974.

The angiographic features of two cases of liver cell adenoma and four cases of focal nodular hyperplasia (FNH) were compared with the angiographic features of eight cases of malignant hepatoma. Pathologic distinctions of various benign liver cell masses were also discussed. Five of the six patients with benign liver cell tumors were symptomatic, while in one a lesion was discovered incidentally during evaluation for trauma. The angiographic features of liver cell adenoma and FNH were similar. Both patients with liver cell adenoma and two patients with FNH had an enlarged hepatic artery. All 6 patients demonstrated hypervascularity. In four cases, the arterial supply originated from the periphery of the mass with numerous relatively parallel vessels supplying the lesion. There was no evidence of arteriovenous shunting, portal vein invasion, or vascular laking. One of the liver cell adenomas and three of the FNH cases showed considerably more prominent vascular staining than the adjacent normal parenchyma, while in the other two cases there was only minimally increased stain. A distinct tumor margin could be recognized in the parenchymal phase of all cases, except one with FNH. The angiographic findings of benign lesions usually differ sufficiently from those of most malignant hepatomas to enable presumptive diagnosis. While abnormal vascularity and increased parenchymal stain were usually present in both groups, the vascular pattern was considerably more bizzare in the malignant tumors. Possible etiologic association of hepatic adenomas and oral contraceptives is suggested.

8946 ANGIOGRAPHIC FINDINGS IN FOCAL NODULAR HYPERPLASIA OF THE LIVER. *(Ger.)* Zurbriggen, S.; Tylen, U. (Univ. Clin., S-221 85 Lund, Sweden). *Fortschr. Geb. Roentgenstr. Nuklearmed.* 122 (5):404-409, 1975.

Hypervascularized tumors were found in the livers of four patients (3 women and 1 man, aged 17-47 yr) by celiac angiography. The male patient had a history of recurrent postprandial discomfort in the upper abdomen and was hospitalized with subicterus and increased bilirubin values. Celiac arteriography was performed because a moderate delay in transit was present in the lower duodenum on barium swallow. After surgical excision of a tumor measuring 3 x 3 cm from the right lobe of the liver, pathological examination showed it to be a focal nodular hyperplasia. Bilirubin levels remained increased and abdominal discomfort persisted postoperatively, but followup angiography eight yr postoperatively showed no evidence of a recurrence. Nodules were found in the livers of two women with no symptoms of liver disease during surgery for removal of a uterine myoma and for extrauterine pregnancy, resp.; one of these patients had taken oral contraceptives for ten yr. The first patient had angiographic evidence of a tumor in the caudal region of the liver and the second, two tumors in the left and quadrate lobes, resp. Scintigraphy with ^{99}Tc and ^{188}Au, resp., showed decreased activity in the tumor area. In the first patient, histological examiniation revealed pronounced cellular atypia and a central scar. In the second patient, both tumors were surrounded by a capsule of connective tissue and were intersected by radial septa of connective tissue. No signs of recurrence were found 12 and 30 months after tumor excision, resp. The fourth woman, who had a five-yr history of diabetes, was hospitalized with acute pancreatitis. Celiac angiography, performed to rule out a space-occupying lesion, was consistent with focal nodular hyperplasia. A liver scan was normal. The tumor was not removed, and three yr after diagnosis the patient still has no signs of liver disease.

8947 ANGIOGRAPHIC FINDINGS IN MULTIPLE BILE-DUCT HAMARTOMAS OF THE LIVER. *(E.)* McLoughlin, M. J.; Phillips, M. J. (Toronto General Hosp., Toronto, Ontario, Canada). *Radiology* 116(1): 41-43, 1975.

The angiographic appearance of the liver in a 42-yr-old man with multiple bile-duct hamartomas is described. Selective celiac and superior mesenteric angiography revealed that the left lobe of the liver was supplied by the celiac artery and the right lobe by the superior mesenteric artery. Multiple small areas of abnormal vascularity were scattered throughout both lobes, and in several areas the lesions took the form of grape-like clusters of small rings 2 to 3 mm in diameter. The angiographic differential diagnosis in this case included hepatoma, focal nodular hyperplasia, liver-cell adenoma, cavernous hemangioma, and vascular metastases. The absence of large feeding vessels, bizarre tumor vessels, laking, or arteriovenous shunting made multicentric hepatoma unlikely. Focal nodular hyperplasia and liver-cell adenoma (which range from 1 to 20 cm in diameter and are usually solitary) were also ruled out. The most difficult differential diagnosis was of multiple, highly vascular metastases. However, the appearance of clusters of small rings, much smaller and different in appearance from those formed in cavernous hemangiomas, has not been reported before. This ring pattern, which may prove to be a characteristic of bile-duct hamartoma, is attributed to the tendency of hamartomas to surround small areas of normal liver parenchyma.

8948 LIMITATIONS OF ANGIOGRAPHY AND SCANNING IN DIAGNOSIS OF LIVER MASSES. *(E.)* Lerona, P. T.; Go, R. T.; Cornell, S. H. (Section of Diagnostic Radiology, Univ. Iowa, Iowa City, Iowa). *Radiology* 112(1):139-145, 1975.

The accuracy and limitations of liver scanning and liver angiography for the determination and localization of liver masses were compared. A total of 36 proven cases of liver masses (details given; pathologic confirmation obtained by laparotomy, liver biopsy, and/or postmortem examination), which had both angiography and liver scan, formed the basis of the research. For angiographic examination of the liver, abdominal bolus aortography in biplane projections was employed, followed by celiac selective arteriography. The percutaneous transfemoral approach and the transaxillary method were used. Celiac selective arteriograms were obtained using a No. 7 French performed catheter. Fifty to 60 ml of contrast agent (Vascoray or Renovist) were injected at 10-12 ml/sec and serial filming covered 15 sec from the start of the injection. Anterioposterior films were obtained and oblique views were taken occasionally. The radiographic technique was adjusted to the patient's size. All liver scans were done with the Ohio-Nuclear Dual Probe 5-inch crystal rectilinear scanner using the 109-hole focusing collimator. The patients were given an i.v. injection of 3 mCi of ^{99m}Tc sulfur colloid, and scanned approximately 10 to 15 min later. With the "window" setting of 30 keV, the maximum count rate was determined and scanning started using 1/16-inch line spacing. Simultaneous anterior-posterior and left-right lateral views were obtained. Of the 36 liver masses examined by both methods, the scan and the angiogram made 33 correct diagnoses each for an accuracy of almost 92%. The two methods were in agreement in 34 cases, although both had false negative results in two of these. In the two cases in which there was no agreement, the correct diagnosis was made by either angiography or the scan. The combined accuracy of both procedures was 94% in the 36 cases examined. It was concluded that liver scanning done by the method described is as accurate as angiography in the detection of liver masses; however, angiography can be more specific as to the nature of liver masses and is more accurate in their localization than the scan. The circumstances in which liver angiography following liver scanning should be done were briefly discussed.

8949 COMBINED CONTRAST AND RADIONUCLIDE ANGIOGRAPHY OF THE LIVER.

(E.) Waxman, A. D.; Finck, E. J.; Siemsen, J. K. (Los Angeles County-Univ. Southern California Medical Center, 1200 N. State St., Los Angeles, Calif. 90033). *Radiology* 113(1):123-129, 1974.

Contrast hepatic angiography, i.v. rapid sequential liver scanning with ^{99m}Tc-sulfur, and celiac or hepatic radionuclide angiography were compared for their ability to detect intrahepatic tumors in 18 patients with suspected liver disease. Selective celiac or hepatic angiography was performed by the percutaneous transfemoral approach. Twenty to 30 ml of Hypaque-M (75%) was unjected at 15 ml/sec and films were exposed to include 30 sec from the start of contrast injection. With the catheter still in the celiac or hepatic artery, the patient was placed under an Anger camera and 10 mCi of ^{87m}Tc-sulfur was injected. From the onset of the radionuclide injection, sequential Polaroid and 70 mm films were exposed. Patients were reexamined 49 hr later using an i.v. bolus injection of 10 mCi ^{99}Tc-sulfur colloid, and Polaroid films were exposed. Intra-arterial radionuclide angiography and subsequent static scans were superior to contrast angiography in the evaluation of small avascular lesions. Radionuclide angiography was inferior to contrast angiography in evaluation of small hypervascular lesions. Large vascular or avascular lesions were detected equally well by both methods. I.v. radionuclide perfusion distribution (flow) studies were equal or slightly inferior to the intra-arterial method in detecting hepatic lesions. The i.v. radionuclide study was superior in determining arterialization of the hepatic bed. Vascular lesions of the left lobe and inferior border of the liver were better detected by the intra-arterial injection of radiocolloid than by the i.v. route. The combined use of all three techniques was superior to any single modality in evaluation of hepatic lesions.

8950 USE OF HISTOCHEMICAL TECHNIQUES FOR STUDYING ENZYMES IN BIOPSIES FOR THE DIAGNOSIS OF LIVER DISEASE.

(Ger.) Petzold, H.; Rogos, R. (Bereich Medizin, Karl-Marx-Universitat, DDR-701 Leipzig, Johannisallee 32, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(5/6):301-305, 1974.

Histochemical determinations of adenosine triphosphatase (ATPase), acid phosphatase (AcP), alkaline phosphatase (AP), and succinate dehydrogenase (SDH) were performed in needle biopsies from 354 patients with active cirrhosis, 265 with chronic active hepatitis, 86 with chronic cholangiohepatitis, 162 with cholangitic fibrosis, 150 with infectious hepatitis, and 99 with stage I fatty liver. Since biopsies large enough for conventional histological methods were only obtained from 12% of the patients with cirrhosis, the histochemical techniques proved particularly valuable for evaluating these patients. In infectious hepatitis, ATPase activity disappeared from bile ductules and passed into Kupffer cells and sinusoids; AP activity increased in the entire lobule; and AcP activity increased, while that of SDH decreased. Normalization occurred after six wk in patients with uncomplicated infectious hepatitis. Even if conventional histological findings improved, enzyme activities did not normalize in patients with persistent hepatitis who were positive for hepatitis B antigen. Followups showed that patients often developed chronic aggressive hepatitis and cirrhosis within a few months if the cytoplasm was strongly positive for AP. In chronic aggressive hepatitis, ATPase was present only in sinusoid walls and Kupffer cells and passed into bile ductules only when hepatitis became less active. AcP was detected in peripheral sinusoid walls and was found as dark brown cytoplasmic granules in all hepatocytes. As the disease progressed, ATPase, AcP, and AP activity increased in connective tissue; an extra band appeared in serum AP isoenzymes in these patients. Although no changes in the activities of these enzymes occurred in the liver in chronic cholangitis and cholelithiasis, cholangitic fibrosis was accompanied by positive reactions for ATPase and AP in connective tissue and for cytoplasmic AP, while short, dilated, black sinusoids were found in the entire hepatic lobule. ATPase was present in many Kupffer cells and sinusoids, but in only a few bile ductules. These parenchymal reactions are so characteristic that they can be used to establish a diagnosis, even if no connective tissue or Glisson's triangles are present in the biopsy or if only negative periportal fields are found. Although AP activity increased in all forms of fatty liver, ATPase reacted differently. No bile ductules were detected in alcoholic fatty liver, but they were present in other forms despite large deposits of fat. Connective tissue showed positive reactions for AP and AcP when fatty liver developed into cirrhosis. As fatty liver regressed, ATPase activity decreased in a large number of bile ductules and sinusoids, and Kupffer cells became smaller. AP first disappeared from the intermediate part of sinusoids and then in the center of the lobule. AcP was present as bands of dark brown granules, and SDH activity increased later. These same changes in enzyme activity occurred in connective tissue.

8951 IMMUNOFLUORESCENT DETECTION OF α_1-ANTITRYPSIN IN PARAFFIN EMBEDDED LIVER TISSUE. *(E.)* Ray, M. B.; Desmet, V. J. (Departement Medische Navorsing, Academisch Ziekenhuis Sint-Rafael, B-3000 Leuven, Belgium). *J. Clin. Pathol.* 28(9):717-721, 1975.

The ability of the indirect immunofluorescent technique to detect α_1-antitrypsin was investigated in Bouin-fixed, paraffin-embedded liver tissue from patients with established or suspected α_1-antitrypsin deficiency. The technique was applied on both frozen and paraffin sections of liver biopsies from three patients with clinically and biochemically proven α_1-antitrypsin deficiency; on paraffin sections of liver biopsies from four patients with PAS-positive, diastase-resistant inclusions in hepatocytes; and on frozen and paraffin sections of liver tissue from six control patients with other liver diseases. α_1-Antitrypsin was detected in both frozen specimens and paraffin sections of the three patients with proven α_1-antitrypsin deficiency and in the four biopsies with PAS-positive inclusions. Of the seven positive biopsies, three were diagnosed as cirrhosis and four as periportal vesicular steatosis. All positive biopsies showed bright fluorescence in the cytoplasm of the liver cells, although one of the biopsies had been stored for eight yr. Specific fluorescence was constantly detected in the periportal hepatocytes with varying degrees of positivity. The cellular location and the brightness of the fluorescence were the same in frozen and paraffin sections. No fluorescence was observed in the six control biopsies. These findings demonstrate that paraffin-embedded specimens are suitable for immunofluorescent detection of α_1-antitrypsin and that a retrospective study on old paraffin blocks is possible.

8952 GALLIUM-67-CITRATE SCANNING IN PRIMARY CANCER OF THE LIVER: DIAGNOSTIC VALUE IN THE PRESENCE OF CIRRHOSIS AND RELATION TO ALPHA-FETOPROTEIN. *(E.)* Levin, J.; Kew, M. C. (Johannesburg General Hosp., University of the Witwatersrand, and South Africa Primary Liver Cancer Res. Unit, Johannesburg, South Africa). *J. Nucl. Med.* 16(10): 949-951, 1975.

The usefulness of ^{67}Ga scanning and the correlation of radionuclide uptake and alpha-fetoprotein synthesis in cases of primary hepatocellular cancer associated with cirrhosis were investigated. Gallium-67-citrate and ^{99m}Tc-sulfur colloid scans were performed in 38 untreated Negro patients with histologically proven primary hepatocellular cancer. Posterior, anterior, and right lateral scans were recorded and comparatively studied. The presence or absence of cirrhosis was determined at necropsy, laparotomy, or by percutaneous biopsy and sera were tested for alpha-fetoprotein by immunodiffusion. In 70% of the patients, the ^{67}Ga was selectively taken up by the defect(s) seen on the ^{99m}Tc-sulfur colloid scan. Selective uptake of ^{67}Ga occurred in 66% of the 18 patients with cirrhosis, and in 72% of the 13 without cirrhosis. However, no explanation was offered for the false-negative scanning results in 30% of the patients. Alpha-fetoprotein detected in 68% of the patients suggested a slight correlation with selective uptake of the radionuclide; this contrasts with previously reported results.

8953 THE ACCURACY OF LIVER SCANNING IN THE DETECTION OF METASTATIC DISEASE. *(E.)* Kilgore, E. S.; Calabretta, A. M.; Weidner, W. A.; Graham, W. P. (Milton S. Hershey Medical Center of the Pennsylvania State Univ., Hershey, Pa.). *J. Surg. Oncol.* 7(5):351-354, 1975.

To determine accuracy of the liver scan as a diagnostic tool in detecting hepatic metastases, the records of 429 patients who had undergone liver scanning with technetium 99m sulfur colloid were reviewed. Of these patients, 125 had a confirmatory procedure (needle biopsy in 15 patients, abdominal exploration in 69, and autopsy in 41) done within six weeks of their scan. Nineteen patients who had negative scans were proven to have hepatic metastases. Fourteen patients had positive scans, which could not be substantiated by one or more of the above confirming examinations. It is concluded that such scanning proved sufficiently inaccurate to preclude its use in the routine evaluation of metastatic disease.

8954 WEDGED HEPATIC VENOGRAPHY IN PATIENTS WITH END-TO-SIDE PORTACAVAL SHUNTS. *(E.)* Reuter, S. R.; Orloff, M. J. (Depts. Radiology and Surgery, Univ. California, San Diego, Calif.). *Radiology* 111(3):563-566, 1975.

Wedged hepatic venograms in five patients with end-to-side portacaval shunts were evaluated for: sinusoidal filling pattern; the presence of portal veins and hepatic vein filling; the direction of washout of contrast medium; and the presence of collateral veins between the hepatic and splanchnic sides of the shunt. The sinusoidal filling pattern was relatively homogeneous in one patient, moderately nonhomogeneous in three, and had a nodular appearance in one. Portal vein filling occurred in all patients but hepatic vein filling in only one. In three patients with portal vein filling, the contrast medium washed out in a peripheral hepatopetal direction. Collateral veins were present between the hepatic and splanchnic sides of the shunt in all patients. In four of the five, the communication was between the cystic vein *via* the pancreaticoduodenal vein to the superior mesenteric vein. The contrast medium entered the superior mesenteric vein in two of these four patients; the washout was in a central hepatofugal direction. In the fifth patient, a capsular collateral vein had developed between the inferior edge of the right lobe of the liver and the gastroepiploic vein. It is concluded that collateral blood flow develops between the portal and splanchnic limbs of end-to-side portacaval shunts through cystic and pancreaticoduodenal veins because of the residual elevated pressure on the portal side of the ligature. The blood flow in the portal vein may be either hepatopetal or hepatofugal, probably depending on the overall resistance in the hepatic veins at time of surgery.

8955 PRELIMINARY RESULTS OF A TRIAL IN AMOEBIC LIVER ABSCESS.

(E.) Meyer, H. A. (Kilimanjaro Christian Medical Center, Moshi, Africa). *East Afr. Med. J.* 51(9):923-927, 1974.

The 'Serameba' latex agglutination test was compared with the immunofluorescence antibody test, and subsequent treatment with tinidazole was evaluated. As the clinical findings in amebic liver abscess were noted to be extremely varied, the diagnostic value of the latex agglutination test and the dry blood sample technique for immunofluorescence antibody testing was evaluated in 26 patients with hepatic amebiasis. The clinical diagnosis and aspiration results were tentatively correlated with the test values. Patients with positive aspiration results showed a trend to higher titers in the immunofluorescence antibody and latex agglutination tests. The dry blood sample modification appeared less sensitive, yet useful in the confirmation of diagnosis. Seventeen patients with clinical and serological evidence of hepatic amebiasis were administered p.o. tinidazole, 2 mg/day, for two to three days. Twelve patients were cured, two improved and were eventually cured, and three required additional metronidazole. The oral tolerance was good; side-effects included nausea, paresthesia of the hands, moderate ataxia of the legs, and raised alkaline phosphatase levels. There were miscellaneous benign complaints, including dizziness, headache, and itching. No relapses or cardiotoxicity were detected. It is concluded that tinidazole is both effective and well tolerated in the dosage tested.

8956 HEPATIC "INTRAVENOUS FAT PIGMENT" IN INFANTS AND CHILDREN RECEIVING LIPID EMULSION.

(E.) Koga, Y.; Swanson, V. L.; Hays, D. M. (Children's Hosp. of Los Angeles, Los Angeles, Calif. 90027). *J. Pediatr. Surg.* 10(5):641-648, 1975.

The deposition of fat pigment in the liver was evaluated retrospectively in 23 infants and children (10 females and 13 males) who had received a soybean emulsion (Intralipid) i.v. and for whom complete autopsic records were available. Pigment was found in hepatic cells (HC) in 14 of the 23 patients and in reticuloendothelial cells (REC) in 22 cases. One of eight patients older than four yr at the time of infusion of fat emulsion had pigment in HC, while ten of 15 patients younger than four yr had significant pigment deposition. Ten of 14 patients with acute abdominal diseases (e.g., peritonitis, intestinal perforation, ruptured omphalocele) had increased pigment in HC compared with three of nine patients without such conditions. Patients infused with emulsion at rates less than 0.5 g/kg/hr had less pigment deposition than patients infused at faster rates. Neonates infused at rates less than 0.2 g/kg/hr for 24 hr had less HC than those infused at higher rates. The quantity of REC pigment bore no apparent relation to age, clinical diagnosis, rate or total dose of fat emulsion, but was increased in groups infused for more than 14 days. The HC pigment varied from the REC pigment in its generally faint anisotropy and distinctly positive staining with PAS, indirect fuchsin, and phospholipid stains. The HC pigment most closely resembles lipofuscin. The cause of this pigment deposition is unknown but may be related to immaturity of an enzyme system or vitamin E deficiency.

8957 ULTRASTRUCTURAL FEATURES OF THE LIVER DURING TREATMENT WITH ORAL CONTRACEPTIVES.

(It.) Cirri, G. P.; Paci, P. (Instituto Anatomia Istologia Patologica, Universita Firenza, Italy). *Patol. Clin. Obstet. Ginecol.* 3(1):30-37, 1975.

Electron microscope examinations were performed on needle biopsies from the livers of two women, aged 29 and 24 yr, resp., with cholestatic jaundice induced by an oral contraceptive containing 2.5 mg of lynestrenol and 0.075 mg of mestranol. Cholestatic jaundice developed after nine days and seven months of treatment, resp., and lasted about 30 and 60 days, resp. In both cases, the bile tubules were dilated and their lumina were partially or completely filled with an amorphous, electronopaque material. Lipofuscin-type pigments and bile pigments were present at the bile pole of the hepatocytes or, in some cases, were dispersed throughout the cytoplasm. Mitochondria were irregularly shaped and some contained paracrystalline inclusions oriented along the longer axis of the organelle. The vacuolar component of the Golgi apparatus contained extremely electronopaque material, and the smooth endoplasmic reticulum was highly developed, tending to microvesiculation in some cases. Kupffer cells showed morphological evidence of intense activation. These findings were more pronounced in the second patient, who had more severe jaundice of longer duration than that of the first patient. In addition, signs of regeneration were clearly evident in the biopsy from the second patient. Changes found at the vascular pole of the hepatocytes and in intercellular spaces were very interesting. In both patients, Disse's spaces were dilated and filled with an amorphous, electronopaque material and, in some cases, with bundles of collagen fiber. These changes are manifestations of functional impairment of the vascular pole, resulting in a decrease in the rate of transport between blood and tissues. This situation might account for the presence in the second biopsy of cellular diastasis in the hepatic parenchyma. This was accompanied by the appearance of microvilli along the sides of the plasmalemma of two adjacent hepatocytes. These changes are generally considered to be a manifestation of functional compensation to ensure that the hepatocyte has a surface large enough for transport of nutrients. Changes in Disse's spaces obstruct this transport. The changes described here are not specific for cholestatic jaundice induced by oral contraceptives, but are also found in patients with cholestatis of pregnancy and those with cholestatic jaundice induced by anabolic agents.

8958 LIVER FUNCTION TESTS AFTER TREATMENT WITH THE ORAL CONTRACEPTIVE, DEPOSISTON, FOR SIX MONTHS. *(Ger.)* Brugmann, E.; Goretzlehner, G.; Towe, J.; Rehpenning, W. (Bereich Medizin, Universitat Rostock, Germany). *Zentralbl. Gynaekol.* 97 (11):669-673, 1975.

Liver function was studied in 18 women, aged 17 to 38 yr, who were given Deposiston (1 mg of 17α-ethynyl-3-*iso*propylsulfonylhydroxyestradiol on days 4, 11, and 18 of the menstrual cycle and 10 mg of norethisterone acetate on day 25). At the end of two cycles of treatment, only a decrease in SGPT had occurred which was of borderline significance. By the end of six cycles of treatment, values for the thymol turbidity test and total serum protein and serum albumin concentrations had decreased; these changes were of borderline significance. Significant increases occurred in α_1- and β-globulin concentrations and the serum cholesterol level. The half-time for indocyanine green excretion was also increased, but no pathological significance could be attached to this finding. To obtain definitive information on the effect of Deposiston on liver function, it will be necessary to continue these studies for a longer period.

8959 ACUTE LIVER FAILURE: A METHOD OF ARTIFICIAL SUPPORT. *(It.)* Williams, R. (King's Coll. Hosp. Medical Sch., London, England). *Minerva Chir.* 29(18):968-973, 1974.

Hepatic necrosis was induced in dogs by portacaval shunt surgery followed by ligation of the hepatic artery. Blood from these dogs was perfused through columns containing charcoal to adsorb water-soluble toxic compounds or through an ion-exchange resin to remove toxic compounds conjugated to protein. In comparison to controls, dogs whose blood was perfused through charcoal columns survived significantly longer. Those whose blood was perfused through ion-exchange resin survived longer than controls, but the difference was not significant. Blood ammonia levels gradually increased in controls, but not in dogs whose blood was perfused through charcoal. While serum bilirubin levels gradually increased in controls, bilirubin levels decreased significantly in dogs whose blood was perfused through the resin. The main problem with this technique was that the charcoal and resin removed platelets and WBC from the blood as well as toxic substances. Absorption of platelets was prevented by coating the charcoal with a special material which still permitted adsorption of water-soluble compounds. However, perfusion of blood through the resin caused such a marked decrease in the platelet count that dogs treated by this method did not survive as long as dogs whose blood was perfused through charcoal; many of those in the former group died of hemorrhages. Recently, patients with stage 4 hepatic coma caused by halothane, viral hepatitis, *Amanita phalloides* intoxication, and other factors have been treated by perfusing their blood through a carbon column after they failed to respond to other forms of therapy. Dialysis was performed for 4 to 5 hr/day, and patients were kept on the artificial liver for periods of four to six days. Four of the six patients survived and are in good health. Two died: one as a result of the coma and the other of a hemorrhage. None of these patients regained consciousness before they had undergone three courses of treatment on the liver machine. This is probably due to accumulation of toxic metabolites in the brain. Consequently, the method of artificial support should be capable of prolonged, repeated and reproducible operation.

8960 USE OF DIALYSIS IN THE TREATMENT OF RENAL FAILURE IN LIVER DISEASE. *(E.)* Parsons, V.; Wilkinson, S. P.; Weston, M. J. (King's Coll. Hosp., Denmark Hill, London, S.E. 5, England). *Postgrad. Med. J.* 51(598):515-520, 1975.

Indications for dialysis in patients with hepatorenal failure are reviewed together with the management of dialysis patients with severe hyponatremia, hypocalcemia, hypophosphatemia, and alkalosis. The administration of calories, insulin, anticoagulants, and antibiotics, the types of dialysis to be used, and the correction of pulmonary and cardiac complications during dialysis are also discussed. Results of dialysis in 55 patients with combined hepatic and renal failure are given by disease type and method of dialysis. Mortality was 75% in 16 patients treated by hemodialysis alone, 76% in 33 patients treated by peritoneal dialysis alone, and 50% in six patients treated by both methods combined. None of 14 patients with end-stage liver failure due to cirrhosis survived, and mortality was 78% in 22 patients with fulminant-hepatic failure. All five patients with severe hyperbilirubinemia due to biliary tract obstruction (with oliguric or anuric renal failure) survived. It is concluded that dialysis should be reserved for the correction of fluid and electrolyte problems in patients with obstructive jaundice, those whose hepatic failure has some chance of recovery, and/or those who are awaiting hepatic transplantation.

8961 HEPATIC SUPPORT BY CROSSED CIRCULATION BETWEEN HUMANS: SIX CASES. *(It.)* Motin, J.; Bouletreau, P.; Petit, P.; Latarjet, J. (Edouard Herriot Hosp., Lyon, France). *Minerva Chir.* 29(18): 989-993, 1974.

Crossed circulation was used to treat four males and two females (aged 9 to 42 yr) with hepatic coma (stage III) developing seven days or less after the onset of jaundice. The jaundice was accompanied by prothrombin values lower than 20%, as well as signs of disseminated intravascular coagulation; and by cytolysis of 70% or more in needle biopsies performed after exchange transfusions or injection of Stuart's prothrombin-proconvertin factor and antihemophilic factor B. In three patients, an arteriovenous shunt was placed between distal blood vessels of the extremities, and a double-headed roller pump was inserted into the circuit between the donor and recipient to permit regulation of flow. A higher flow rate (6-12 ml/min/kg) was obtained in three patients with an arterial-arterial shunt between the superficial femoral arteries. Of the six patients treated in this way, three died in hepatic coma without regaining consciousness although one patient had histological evidence of hepatic regeneration. One of these three patients died of acute pulmonary edema. Of the two patients who recovered, one was a 39-yr-old woman who failed to respond to glucose, coenzyme A, cocarboxylase, lipoic acid, or γ-globulin. In less than 12 hr after institution of crossed circulation, clotting factors increased to 50% and bilirubin levels dropped. Improvements in the electroencephalogram occurred after 12 hr, the patient responded to pain and noise after 36 hr, and 70% of the hepatic parenchyma had regenerated after 84 hr. She regained consciousness after 108 hr and crossed circulation was discontinued after 114 hr for technical reasons. The condition of the patient deteriorated, both neurologically and biologically, but she responded to symptomatic treatment and is alive and well four yr later. The second patient who recovered was a nine-yr-old girl who regained consciousness 12 hr after institution of crossed circulation. Crossed circulation had to be discontinued after 47 hr because the patient developed *Escherichia coli* septicemia from an exposed fracture on the donor's leg. She still had cholestatic jaundice after three months and was treated with corticosteroids. The jaundice disappeared after four months and the patient is alive and well after 18 months; all laboratory tests and a liver biopsy were normal.

8962 HEPATIC ARTERY LIGATION FOR EXSANGUINATING LIVER INJURIES IN CHILDREN.

(E.) Canty, T. G.; Aaron, W. S. (Univ. Louisville, Sch. Medicine, Louisville, Ky.). *J. Pediatr. Surg.* 10(5):693-700, 1975.

Selective right hepatic dearterialization was performed in two boys (aged 2.5 and 7 yr) with bursting and exsanguinating injuries of the right lobe of the liver secondary to blunt trauma. The first child was in profound shock. Selective dearterialization by ligation of the right hepatic artery distal to the cystic artery was performed with immediate cessation of blood loss from the posterior dome of the right liver lobe, rapid return to normotensive state, and return of urine output. The second child presented with arterial bleeding from a laceration on the undersurface of the right liver lobe. The cyctic artery was noted to come off the right hepatic as it entered the liver in the porta. Right hepatic artery ligation proximal to the origin of the cyctic artery resulted in immediate and complete cessation of bleeding. Neither child underwent simultaneous cholecystectomy and T-tube drainage of the extrahepatic biliary tree. Both children tolerated the ligation procedure quite well; each showed transient elevation of liver enzymes, suggesting minimal ischemia, with a gradual return to normal. Revascularization was demonstrated in the first case four days after ligation. Despite postoperative complications related to severe pulmonary injuries, the children were discharged on the 11th and 17th days after injury, resp. Follow-up studies at nine and 21 months showed normal liver function tests, normal oral cholecystogram, chest x-ray, and hepatic scintiscan.

8963 DISTRIBUTION OF ALKALINE PHOSPHATASE ACTIVITY IN HEALTHY AND DISEASED HUMAN LIVER TISSUE.

(E.) Hagerstrand, I. (Malmo General Hosp., 21401 Malmo S, Sweden). *Acta Pathol. Microbiol. Scand.* [*A*] 83(5):519-526, 1975.

Alkaline phosphatase activity in paraffin-embedded sections of 820 human liver biopsies was determined with an azo-dye method. The specimens were obtained from 102 subjects without liver disease, 161 subjects with acute hepatitis, 95 with chronic hepatitis, 68 with extrahepatic obstruction, 126 with cirrhosis, 109 with steatosis, and 50 with primary or secondary malignancies of mainly epithelial origin. Three specimens that contained α_1-antitrypsin deposits and 74 that showed only negligible morphologic changes (mild cholestasis, other pigment deposits, slight fibrosis) were also studied. Alkaline phosphatase activity of healthy human liver tissue was confined to vessel walls and to sinusoids, especially those around central veins. Faint canalicular staining was detected in only 20 of the 102 healthy specimens. Increased sinusoidal alkaline phosphatase activity was seen in acute hepatitis, chronic aggressive hepatitis, extrahepatic obstruction, cirrhosis, and malignant tumors. A patchy canalicular staining was fairly common in chronic aggressive hepatitis, cirrhosis, and extrahepatic obstruction, but more pronounced canalicular staining appeared mainly in the specimens containing malignant tissue. Thirty-eight of the 50 malignant specimens showed intense staining of both perifocal and remote canalicular structures. Intense canalicular staining also occurred in specimens from three patients with extrahepatic obstruction due to malignant growths and from five with obstruction due to stones. An isolated, diffuse canalicular reaction was seen in two of the three specimens with α_1-antitrypsin deposits, in 15 of the 72 with minor morphologic changes, and in all of 34 additional specimens of normal histologic appearance. Two of the latter came from patients with renal carcinoma without liver metastases. These results show that alkaline phosphatase activity in sinusoids is increased in various liver diseases but that appreciable canalicular activity is most prominent in parenchyma involved by malignant tumors.

8964 CHARACTERIZATION OF α_1-ANTITRYPSIN IN THE INCLUSION BODIES FROM THE LIVER IN α_1-ANTITRYPSIN DEFICIENCY. *(E.)* Jeppson, J. O.; Larsson, C.; Eriksson, S. (Malmö General Hosp., Malmö, Sweden). *New Engl. J. Med.* 293(12):576-579, 1975.

α_1-Antitrypsin was isolated from PAS-positive inclusion bodies from the hepatocytes of patients with α_1-antitrypsin deficiency and further purified to enable more detailed chemical analysis. This analysis included cyanogen bromide degradation, polyacrylamide gel electrophoresis, amino acid analysis, gas chromatographic analysis of the carbohydrates, and determinations of sialic acid and total neutral sugars. Electrophoresis showed a small but consistent difference in molecular size between serum α_1-antitrypsin (Pi^{MM}, 56,000 daltons) and liver α_1-antitrypsin (50,000 daltons). Further characterization with electrofocussing of the fragments obtained after cyanogen bromide degradation revealed a pattern similar to that of serum α_1-antitrypsin of Pi^{ZZ} type and different from that of the Pi^{MM} type. With the exception of arginine and phenylalanine, the amino acid compositions of the liver protein and serum α_1-antitrypsin (Pi^{MM}) were similar. Carbohydrate analysis showed a complete lack of sialic acid in the liver protein, and the levels of other monosaccharides were low in the liver as compared with the serum protein. The data indicate that the accumulation of hepatic globules in α_1-antitrypsin deficiency is probably related to the physical properties of the defective antitrypsin, which include marked insolubility and a tendency toward aggregation. They strongly suggest an abnormal amino acid sequence in the peptide chain of the deficient antitrypsin. The interference with glycosylation in α_1-antitrypsin deficiency may be related to steric hindrance.

8965 THE MORPHOLOGY OF INTRA- AND EXTRAHEPATIC BILIARY DISEASE. *(Ger.)* Wohlgemuth, B.; Reichmann, J. (Bereich Medizin, Karl-Marx-Universitat, DDR-701 Leipzig, Liebigstrasse 26, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(5/6):313-317, 1974.

Pathological changes were found in the biliary tracts of 1475 (54%) of a total of 2732 autopsied patients. These changes were present in 896 women (66.8%) and 579 men (33.5%). Biliary disease was the direct or indirect cause of death in 147 cases (5.4%): uncomplicated cholelithiasis in 19 cases; cholelithiasis with cholecystitis in 40; carcinomas of the biliary tract in 70; and sequelae of cholecystectomy in 18. Both cholelithiasis, with and without cholecystitis, and cholesteatosis were most common in patients over 70-yr-old. Malignant tumors were more common in women (50 cases) than in men (20 cases): in women, they consisted of carcinomas of the gallbladder (37), bile ducts (10), and papilla (3), and in men, carcinomas of the gallbladder (9), bile ducts (9), and papilla (2). Of these cancer patients, 41 women and 13 men also had cholelithiasis. All but two cancer patients were in the seventh or eighth decade of life. In three cases, differences were found in the thickness of the biliary tract in conjunction with an initial increase and later rarefaction of elastic fibers. Cholelithiasis resulted in hypertrophy and choledocholithiasis, superficial epithelial defects, and intramural cicatrization with disorganization and disappearance of elastic elements. These changes, which had deleterious effects on motility and immune defense, are regarded as irreversible. In patients with pronounced extrahepatic cholangitis, thick inflammatory infiltrates and lesions of the wall containing deposits of bile pigment were detected. The labeling index with ^3H-thymidine was increased eight-to-nine fold over that found in controls, but the epithelium in the extrahepatic biliary tract showed no evidence of increased proliferation. It is considered that increased labeling of intramural fibroblasts is a manifestation of increased fiber production.

8966 ULTRASTRUCTURAL AND MORPHOMETRIC STUDY OF LIVER BIOPSIES FROM PATIENTS WITH INTRAHEPATIC CHOLESTASIS. I. CORRELATIONS BETWEEN MORPHOMETRIC PARAMETERS OF THE BILE CANALICULI AND THE MARKER ENZYMES OF CHOLESTASIS. *(Ger.)* Roessner, A.; van Husen, N.; Pauls, E.; Gerlach, U.; Themann, H. (Medizinische Universitatsklinik Poliklinik, Westfalische Wilhems-Universitat, D-4400 Munster, Westring 3, Germany). *Virchows Arch.* [*Pathol. Anat.*] 367(1):15-26, 1975.

The volume and surface area of bile canaliculi, expressed as a percentage of the liver volume, and the number of bile canaliculi/electron micrograph were measured in hepatic biopsies obtained with a Menghini needle from 40 patients with intrahepatic cholestasis. Activities of leucine aminopeptidase, 5'-nucleotidase, total alkaline phosphatase, "bile duct" phosphatase, and total bilirubin concentrations were measured in serum from these patients. Intrahepatic cholestasis was diagnosed clinically and was confirmed by increases in marker enzymes of cholestasis; "hepatocyte" phosphatase was increased in the serum in all cases. Statistically significant correlations were found between bile canaliculi ultrastructure and serum leucine aminopeptidase and 5'-nucleotidase activities. The volume of bile canaliculi was significantly increased in patients with increased serum leucine animopeptidase activities, while the number of bile canaliculi was significantly increased in patients with increased serum 5'-nucleotidase activities. Increases in "bile duct" phosphatase, an isoenzyme of alkaline phosphatase, were accompanied by increases in the number of bile canaliculi and in the volume of bile canaliculi, but these correlations were not significant. No correlations were found between bile canaliculi ultrastructure and total alkaline phosphatase activity or total serum bilirubin.

8967 FETAL BILE ACID LEVELS IN PREGNANCIES COMPLICATED BY MATERNAL INTRAHEPATIC CHOLESTASIS. *(E.)* Laatikainen, T. J. (Univ. Central Hosp., Haartmaninkatu 2, SF-00290, Helsinki 29, Finland). *Am. J. Obstet. Gynecol.* 122(7):852-856, 1975.

The influence of maternal intrahepatic cholestasis on fetal bile acid levels was investigated. Serum samples from 42 cases of intrahepatic cholestasis in pregnancy were compared with 20 cord plasma samples from uncomplicated pregnancies serving as controls. Cholic acid (CA) and chenodeoxycholic acid (CDC) levels were determined using gas-liquid chromatography (GLC) and gas chromatography-mass spectrometry (GC-MS). In the control group, the CDC levels averaged 0.88 μg/ml and CA levels averaged 0.94 μg/ml. The cholestasis group showed mean levels of 1.90 μg/ml of CDC and 3.74 μg/ml of CA. The concentrations of both bile acids were highest in maternal blood. There was a positive correlation between the amount of pregnanediol disulfates (2.5-7.0 μg/ml) and the total amount of bile acids. A negative correlation was found between the 16-oxygenated steroid sulfates (1.0-2.5 μg/ml) and bile acids in fetal blood. An increased occurrence of various signs of fetal distress was noted in the cholestasis group, including: green amniotic fluid, abnormal heart rates, and/or abnormal heart rate patterns. There was a perinatal mortality rate of 6.4%. These findings support the opinion that maternal cholestasis may jeopardize fetal well-being.

8968 THE METABOLISM OF 3α, 7α, 12α-TRIHYDROXY-5β-CHOLESTAN-26-OIC ACID IN TWO SIBLINGS WITH CHOLESTASIS DUE TO INTRAHEPATIC BILE DUCT ANOMALIES. AN APPARENT INBORN ERROR OF CHOLIC ACID SYNTHESIS. *(E.)* Hanson, R. F.; Isenberg, J. N.; Williams, G. C.; Hachey, D.; Szczepanik, P.; Klein, P. D.; Sharp, H. L. (Univ. Minnesota Hosp., Minneapolis, Minn. 55455). *J. Clin. Invest.* 56(3):577-587, 1975.

Studies were carried out in a family in which two children suffered from cholestasis resulting from intrahepatic bile duct anomalies. Each child had increased amounts of the cholic acid precursor, 3α, 7α, 12α-trihydroxy-5β-cholestan-26-oic acid (THCA). THCA was tentatively identified in the serum, bile, and urine by gas liquid chromatographic mobilities and confirmed by mass spectroscopy. In one of these patients the metabolism of THCA was studied after an i.v. injection of (^3H)THCA. This study revealed that the cause of the increased amount of THCA in this condition was due to a metabolic defect in the conversion of this compound into cholic acid. After (^3H)THCA administration, a small amount of (^3H)cholic acid was also identified, thus confirming that this metabolic defect was incomplete. In neither of these patients could varanic acid, a metabolite of THCA, be identified. This finding allows the suggestion that the defect in these patients seems due to a deficiency of a 24-hydroxylating enzyme system required to convert THCA into varanic acid. It is suggested that this condition is transmitted in an autosomal recessive fashion, as the two affected patients were of opposite sex, and neither a normal sibling nor the two parents had increased amounts of THCA in their bile.

8969 CONGENITAL FIBROSIS OF THE LIVER, A MESENCHYMATOUS EMBRYOPATHY? *(Fr.)* Moyson, F. (Service de Chirurgie Pediatric et d'Orthopedie, Hopital Universitaire Brugmann, Bruxelles, Belgique). *Ann. Chir. Infant.* 15(6):505-513, 1974.

Congenital fibrosis of the liver (CFL) is usually found in children younger than six yr. The symptoms of CFL are hepatomegaly with or without hematemesis. No change in hepatic function is observed. Death results in 50% of the cases and is usually a result of hemorrhage or uremia. In a nine-yr-old female patient, normal tissue with hyperplasia of fibrous material was found in both the kidney and the liver. This hyperplasia was accompanied by numerous dilated excretory canals and hypoplasia of the veins and lymphatic canals. CFL was a result of both cellular differentiation, which is under genetic control, and hisogenic differentiation, determined by the environment. The mesoderm surrounding the extrahepatic biliary ducts penetrated the liver following the branches of the portal vein. CFL was the result of hyperplasia which did not affect the hepatocytes but permanently damaged the renal cells. Abnormal proliferation of fibrous tissue in hip cartilage, excessive concentrations of hydroxyproline in the urine, Scheuermann's disease and follicular hyperkeratosis often accompanied CFL. Embryological, histological and biochemical findings suggest that CFL results from a mesenchymatous embryopathy.

8970 TRANSFUSIONAL IRON OVERLOAD: THE RELATIONSHIP BETWEEN TISSUE IRON CONCENTRATION AND HEPATIC FIBROSIS IN THALASSAEMIA. *(E.)* Risdon, R. A.; Barry, M.; Flynn, D. M. (Hosp. Sick Children, Great Ormond St., London WC1N 3JH, England). *J. Pathol.* 116(2):83-96, 1975.

The interrelation of liver iron concentration, the duration of iron-loading, and hepatic fibrosis (assessed morphometrically) were studied in 32 liver specimens obtained from 19 heavily transfused patients (aged 4-19 yr) with thalassemia major. Similar observations were made in a matched group of thalassemic patients who had undergone long-term chelation therapy. The degree of liver damage ranged from a very slight increase in fibrous tissue to severe fibrosis and cirrhosis. The severity of fibrosis was closely correlated both with the liver iron concentration and with age. While the relation between fibrosis and age was linear, both the severity and rate of fibrosis were exponentially related to the liver iron concentration. The damage accelerated as the liver iron concentration exceeded 3% dry weight. By producing a modest but significant reduction in the liver iron concentration, chelation therapy resulted in a disproportionate but predictable retardation in the progression of the fibrosis. In general, stainable iron was uniformly distributed between the parenchymal and reticuloendothelial cells during the early stages of iron loading. Parenchymal siderosis was relatively heavier in splenectomized patients and in patients with liver iron concentrations greater than 3% dry weight than in nonsplenectomized patients and those with liver iron levels less than 3% dry weight, but this did not affect the severity of the fibrosis. The data suggest that the iron excess in the thalassemic patients was largely, if not entirely, derived from the large amounts of blood they had received since infancy, and that increased iron absorption is not a significant factor in their iron accumulation. The data also suggest that the relatively mild fibrosis generally found in patients with transfusional siderosis may reflect only the limited survival of these subjects. Thus, while cirrhosis and long-continuing hyperabsorption of iron are associated in certain hyperplastic erythroid states, this is a self-selecting situation in that such patients have had disease mild enough to permit prolonged survival with little or no need for transfusion.

8971 CLINICAL OBSERVATIONS DURING A RELATIVELY EARLY STAGE OF HEPATOCELLULAR CARCINOMA, WITH SPECIAL REFERENCE TO SERUM α-FETOPROTEIN LEVELS. *(E.)* Okuda, K.; Kotoda, K.; Obata, H.; Hayashi, N.; Hisamitsu, T.; Tamiya, M.; Kubo, Y.; Yakushiji, F.; Nagata, E.; Jinnouchi, S.; Shimokawa, Y. (Chiba Univ. Hosp., Chiba 280, Japan). *Gastroenterology* 69(1):226-234, 1975.

Five cases of early hepatocellular carcinoma were analyzed using the α-fetoprotein (AFP) assay. Case I was a 46-yr-old man admitted with diabetes mellitus and abnormal liver function. The level of blood SGOT was 130 Karmen U, SGPT was 145 Karmen U, bilirubin was 0.8 mg, and HBsAg and anti-HBs tests were negative. The AFP level rose from 3 to 10,800 ng/ml in six months. A celiac angiography showed a small lesion in the right lobe. Lobectomy revealed a differentiated, grade II, hepatocellular carcinoma. The AFP level decreased to 9 ng/ml by seven months post-surgery, with no recurrence. Case II was a 68-yr-old male admitted with jaundice. A needle biopsy revealed chronic active hepatitis. The level of SGOT was 52 Karmen U, SGPT was 31 Karmen U, a bromosulfophthalein test showed a 21% retention at 30 min. The AFP level rose from 18 to 1200 ng/ml within one month. The test for HBsAg was positive. A right hepatic resection was performed. The tumor recurred and the patient expired. Case III was a 55-yr-old male admitted with abnormal liver tests. Chronic active hepatitis was diagnosed. Biopsy revealed no neoplasm but there was some splenic action on laparoscopy. After three months, the SGOT level rose to 300 Karmen U and the AFP level rose to 1500 ng/ml. The patient expired from hepatic failure. Case IV was a 54-yr-old man admitted with chronic hepatitis complicating schistosomiasis japonica. The RBC count was $3,310,000/mm^3$, bilirubin was 2.8 mg, SGOT was 98 Karmen U, SGPT was 42 Karmen U, the AFP level was 463 mg/ml, and an HBsAg test was positive. The patient expired from cirrhosis and hepatocellular carcinoma. Case V was a 71-yr-old alcoholic with hepatomegaly; the blood chemistry was unremarkable. Celiac angiography revealed hepatocellular carcinoma. AFP remained constant at 5 ng/ml; the patient expired after five yr. Generally, the change in AFP level was found to be most important in assessing tumor growth. The correlation between rising AFP and positive HBsAg may be due to destruction of normal tissues by the expanding tumor.

8972 HEPATIC PORTAL VEIN GAS WITHOUT BOWEL INFARCTION OR NECROSIS. *(E.)* Tedesco, F. J.; Stanley, R. J. (Washington Univ. Sch. Medicine, St. Louis, Mo. 63110). *Gastroenterology* 69(1):240-243, 1975.

A case of intramural bowel gas and hepatic portal vein gas without necrotic or infarcted bowel or intestinal pneumatosis is reported. A 56-yr-old white female underwent a total gastrectomy for Zollinger-Ellison syndrome. The lower esophagus was found to be very thin-walled and markedly structured and was ligated because of a linear tear in the anterior portion made during the dissection. In addition, a proximal jejunal ulcer was removed, an end-to-end anastomosis was carried out, and a cervical esophagostomy and a feeding jejunostomy were performed. On the tenth postoperative day, severe abdominal pain with rebound tenderness resulted in re-exploration, and a distal esophageal perforation was oversewn. The patient was started on gentamicin and clindamycin, but 12 days later developed severe abdominal pain, decreased bowel sounds, and abdominal distention. Radiographs revealed intramural bowel gas and hepatic portal vein gas. At exploration, two i.p. abscesses were found and drained, but the bowel appeared normal. A second radiograph failed to disclose evidence of persistent intramural or portal vein gas or significant bowel distention. Blood cultures were negative, and the subsequent hospital course was unremarkable. The patient was doing well at followup six wk later. The data in this case suggest the entry of gas-forming organisms into the mesenteric venous system secondary to abscess.

8973 FUNCTIONAL AND MORPHOLOGICAL ASPECTS OF THE LIVER IN IDIOPATHIC AND SECONDARY HAEMOCHROMATOSIS. *(Fr.)* Naccarato, R.; Rizzo, A.; Sirigu, F.; Polin, R. (Istituto di Patologia speciale medica e Metodologia clinica dell'Universita di Padova, Italy). *Med. Chir. Dig.* 4(1):1-8, 1975.

The functional and morphological aspects of the liver in idiopathic and secondary hemochromatosis (Hm) were investigated. Thirty-three Hm patients (13 idiopathic Hm, 13 Hm secondary to liver diseases, and 7 Hm due to iron overload) underwent a series of chemical and biological tests. The following analyses were performed: SGOT and SGPT, OCT, BSP retention, fractionated and total bilirubin, prothrombin time, serum proteins, and immunoglobulins. Each patient underwent a liver biopsy. In idiopathic Hm patients, the biological indices were usually normal. BSP retention was slightly altered in 31% of the cases; in 23% of the cases, bilirubin and SGPT levels were changed and the immunoglobulin level was raised. Light microscopy revealed small changes in the liver tissue. In all cases, intense siderosis was observed. Electron microscopy showed increased pigmentation in the hepatocytes. In Hm secondary to cirrhosis, the major changes were in BSP retention, Quick time, and in bilirubin, albumin and immunoglobulin levels. The liver was also altered structurally, showing increased pigmentation and alterations in the hepatocytes. In Hm secondary to an iron overload, there was a correlation with the degree of hepatic siderosis. In any case, the severity of the hepatic lesion was not influenced by the intensity of the siderosis.

8974 HYPERCHOLESTEROLAEMIA IN PRIMARY CANCER OF THE LIVER. *(E.)* Goldberg, R. B.; Bersohn, I.; Kew, M. C. (Johannesburg Hosp., Johannesburg, South Africa). *S. Afr. Med. J.* 49(36):1464-1466, 1975.

To determine the frequency with which hypercholesterolemia occurs in primary hepatocellular cancer (PHC), serum cholesterol levels were measured in 132 black South Africans with this tumor. Because of the association between hypercholesterolemia and obstructive jaundice, serum conjugated bilirubin and alkaline phosphatase levels were measured as indices of cholestasis, and the presence or absence of biliary obstruction was established at necropsy. Only 14 (10.6%) of the 132 patients with PHC had a raised serum cholesterol level and the serum conjugated bilirubin or alkaline phosphatase levels. Only two of 14 patients with biliary obstruction had hypercholesterolemia (277 and 326 mg/100 ml, resp.). In one of these patients, the effects of a cholesterol diet (3 g/day for 72 hr) on *in vitro* cholesterol synthesis in the tumor and on high serum cholesterol levels were studied. Both acetate and mevalonate were used as substrates in assessing cholesterol synthesis. Cholesterol feeding, which markedly suppressed hepatic synthesis in normal subjects, did not inhibit synthesis in the tumor. This result is in agreement with previous studies showing lack of a feedback regulation of hepatic cholesterol synthesis in experimental tumors and also in two other patients with PHC. It is suggested that this defect results from a decrease in the availability of exogenous cholesterol to the malignant hepatocyte, rather than an abnormality in β-hydroxy-β-methyl-glutaryl-coenzyme A reductase from hepatoma tissue.

8975 THE SIGNIFICANCE OF HYPONATRAEMIA IN LIVER FAILURE. *(E.)* Ring-Larsen, H. (Rigshospitalet, Univ. Hosp., Copenhagen, Denmark). *Postgrad. Med. J.* 51(598):542-543, 1975.

The use of peritoneal dialysis for the correction of serum sodium levels in patients with liver failure complicated by hyponatremia was evaluated. Seventeen patients, aged 12 to 69 yr, were studied; all had extremely low serum sodium, advanced liver failure due to acute liver disease, or acute exacerbation in chronic liver illness. Their diseases were diagnosed as cryptogenic cirrhosis (5 patients), alcoholic cirrhosis (6), viral hepatitis (2), halothane hepatitis (2) and common duct stone (1). Five patients had hyperkalemia and two had hypokalemia; these conditions were corrected before the start of dialysis. Peritoneal dialysis was commenced when the serum sodium was below 125 mEq/l. The dialysing solution contained 140 mEq Na$^+$, 4 mEq K$^+$, 1.8 mEq Mg^{2+}, 45 mEq lactate and 1.5% glucose. Protein loss was measured and compensated for by i.v. human albumin administration. Serum sodium rose significantly from 119 mEq/l before dialysis to 130 mEq during dialysis. The serum ammonia in five patients changed from a mean value of 125 µM/l before dialysis to 75 µM/l after dialysis. The 24-hr urinary sodium was extremely low in all but one patient and did not rise following dialysis. Potassium concentrations decreased below the initial levels, and a significant rise in the mean standard bicarbonate was noted. Three patients survived for more than six months; eight died four to seventeen days after dialysis, and six died during the procedure. The survival time is correlated with diuresis, but not with the 24-hr sodium output, nor with the serum sodium concentration before dialysis. The poor prognosis in pronounced hyponatremia is confirmed by the 82% mortality rate.

8976 MONOMERIC IgM IN ACUTE AND CHRONIC LIVER DISEASE. *(Ger.)* Schwarz, J. A.; Kaboth, U.; Reikowski, H.; Jost, H.; Muting, D.; Ortmanns, H. (Med. Klinik Poliklinik, Universitat Saarlandes, D-6650 Homburg/Saar, Germany). *Klin. Wochenschr.* 53(11):535-538, 1975.

Using a modification of the technique of Strobo and Thomasi, monomeric IgM was determined by diffusion in a 5% polyacrylamide gel for 24 hr in sera from patients with acute viral hepatitis, chronic aggressive and chronic persistent hepatitis, cirrhosis, and fatty liver. During the first six wk after the onset of acute viral hepatitis, monomeric IgM was detected one or more times in sera from 56.3% of 80 patients. No relation was found between the time at which monomeric IgM appeared and increases in immunoglobulin fractions, the total immunoglobulin level, rheumatoid factor, and hepatitis B antigen (HBAg) or antibody (HBAb). The test for monomeric IgM was still positive after three months in six patients; two of these patients had histological evidence of chronic aggressive hepatitis when biopsied after one yr. Monomeric IgM was present in sera from 47.5% of 61 patients with chronic aggressive hepatitis and in only 15.4% of 26 patients with chronic persistent hepatitis; in 36.4% of 88 patients with cirrhosis; and in only 4.2% of 24 patients with fatty liver. No monomeric IgM was present in any of 16 clinically and histologically HBAg carriers. Among patients with chronic aggressive and chronic persistent hepatitis and those with cirrhosis, no relation was found between HBAg or between immunoglobulin fractions and the presence or absence of monomeric IgM. However, indirect immunofluorescence showed that the incidence of antinuclear and anti-smooth muscle antibodies was greater in sera that contained monomeric IgM from patients with chronic aggressive hepatitis and cirrhosis than in sera that did not. The reverse relation was true in acute viral hepatitis and chronic persistent hepatitis. No clearcut relation was observed between the incidence of rheumatoid factor and monomeric IgM. The number of patients in each group was too small to analyze statistically. This is believed to be the first report of the detection of monomeric IgM in patients with chronic hepatitis. It is suggested that this test might be useful in establishing a diagnosis and prognosis of chronic liver disease.

8977 KINKY HAIR DISEASE: STUDY OF COPPER METABOLISM WITH USE OF ^{67}CU. *(E.)* Dekaban, A. S.; Aamodt, R.; Rumble, W. F., Johnston, G. S.; O'Reilly, S. (Natl. Inst. Neurol. Commun. Disord.

Stroke, Bethesda, Md.). *Arch. Neurol.* 32(10):672-675, 1975.

The metabolism of ^{67}Cu (3-50 μCi, i.v. or p.o.) was studied in 3 patients with kinky hair disease, 2 patients with hepatolenticular degeneration, and 1 unaffected control. Following administration of the copper, whole body counts were made with scintillation detectors and probe measurements were made with a dual probe instrument. The urine, stools, and blood were analyzed for activity and retention. The serum Cu and ceruloplasmin levels in all patients with kinky hair disease were 1/4 to 1/5 of normal values, while the urinary Cu levels were within the upper normal range. The daily total body counts after i.v. ^{67}Cu injection showed a high retention of Cu in kinky hair disease and hepatolenticular degeneration during the first 7 days; the elimination of Cu was much faster in the control. After p.o. ^{67}Cu administration, patients with kinky hair disease lost a substantial fraction of the administered activity within the first 3 days, while the other subjects retained relatively large percentages of the Cu. The measured absorption of labeled Cu in kinky hair disease was 11-13%, compared with a previously reported value of 56% in normal subjects and patients with hepatolenticular degeneration. In both groups of patients, the labeled Cu was retained at a very high level in the liver and very little entered the circulation during the first 8 days after administration. The incorporation of Cu into the red blood cells was low but satisfactory in kinky hair disease, but, in contrast to the control, plasma ^{67}Cu levels did not increase with time in either group of patients. The results indicate that the administration of a suitable Cu compound which could facilitate the absorption or transport of this metal would be a good starting point in the treatment of kinky hair disease. Compounds such as Cu-albumin, Cu-histidine-threonine, and Cu-threonine and Cu-glutamine complexes are suggested.

8978 PRIMARY HEPATIC LEIOMYOSARCOMA: A REPORT OF TWO CASES. *(E.)* Masur, H.; Sussman, E. B.; Molander, D. W. (Memorial Sloan Kettering Cancer Center, New York, N.Y.). *Gastroenterology* 69(4):994-997, 1975.

Two new cases of primary hepatic leiomyosarcoma are reported, and seven previously reported cases are discussed. A 62-yr-old Caucasian woman presented with progressive fatigue, right upper quadrant pain, abdominal distension, and an enlarged nodular liver four months antemortem. While undergoing diagnostic workup, the patient went into hepatic failure, then renal failure, developed sepsis, and died. At postmortem examination, the liver was 90% replaced by confluent, fleshy, gray-white tumor nodules with focal areas of hemorrhage, necrosis, and cystic degeneration. Microscopically, the tumor was a leiomyosarcoma of predominantly long spindle-shaped cells in interlacing fascicles. A 66-yr-old Caucasian woman presented right upper quadrant pain associated with anorexia and weight loss. Laparotomies revealed a large hepatic mass and subsequent replacement of the right liver lobe with gray-white tumor nodules. The patient died 37 months later; postmorten examination showed an enlarged left liver node and numerous tumor nodules microscopically defined as interlacing spindle-shaped leiomyosarcoma cells. A literature review noted little prior physical or laboratory evidence of the leiomyosarcoma, morbidity related primarily to massive replacement of hepatic parenchyma vs metastases, and the slow tumor growth. Hence, aggressive hepatic surgery was suggested to improve prognosis.

8979 NATRIURETIC HORMONE--ITS POSSIBLE ROLE IN FLUID AND ELECTROLYTE DISTURBANCES IN CHRONIC LIVER DISEASE. *(E.)* Kramer, H. J. (Medizinische Universitats-Poliklinik, 53 Bonn 1, Wilhemstrasse 35-37, West Germany). *Postgrad. Med. J.* 51(598):532-540, 1975.

The possibility that enhanced proximal tubular sodium resorption in chronic liver disease may depend on a natriuretic hormone was investigated. The effects of plasma and plasma fraction IV from seven patients with liver cirrhosis (6 also had ascites) on sodium transport in isolated frog skin and on renal sodium excretion in female Sprague-Dawley rats were compared with the antinatriferic and natriuretic effects of plasma from six healthy subjects. Natriuretic plasma obtained from healthy subjects after acute expansion of the extracellular fluid volume (ECV) significantly inhibited the potential difference (PD) of isolated frog skin by -43.8 ± 5.5% and the short circuit current (SCC) by -41.3 ± 1.7% when applied to the inner skin surface. Control plasma from these subjects and plasma from patients with cirrhosis and ascites inhibited PD by -3.8 ± 4.7% and -5.2 ± 3.7% and SCC by -7.3 ± 4.6% and -11.7 ± 2.5%, resp. Similar effects on PD and SCC were observed with plasma fraction IV. Fraction IV from ECV-expanded healthy subjects caused marked diuresis and natriuresis when injected i.v. into rats, whereas fraction IV from cirrhotic patients failed to affect urinary flow rate, free-water clearance, or renal sodium excretion. These results suggest that at least some patients with cirrhosis and sodium retention may lack sufficient humoral natriuretic activity to promote renal sodium excretion.

8980 A NEW FORM OF PORPHYRIA: ERYTHROPOIETIC PORPHYRIN HEPATITIS. *(Fr.)* Aguade, J.; Herrero, C.; Almeida, J.; Mas, A. C.; Ferrando, J.; De Asprer, J.; Palou, A.; Gimenez, A. (Faculté de Médecine, Université de Barcelone, Spain). *Ann. Dermatol. Syphiligr. (Paris)* 102(2):129-136, 1975.

A case of porphyria in an 8-yr-old girl with symtomatology beginning in early infancy is described. A general physical examination, laboratory examinations, functional hepatic tests, investigation of porphyria and its precursors, as well as uni- and bi-dimensional chromatographies were performed. The clinical symtoms were as follows: extreme photosensitivity, atrophic scarring of exposed areas, mutilation of the distal extremities of the face and hands and a severe hypertrichosis. The mucous membrances seemed intact and the teeth normal. No signs of hepato- or splenomegaly were obvious. The patient presented the characteristics of both cutaneous porphyrin hepatitis (PCT) and erythropoietic protoporphyria (PPE), but the excretion of urinary porphyrins showed a chromatographic "type" different from both PCT and PPE. Large amounts of 5-COOH carboxyl porphyrins were eliminated and high levels of protoporphyrins were registered in the erythrocytes as well as in the erythroblasts of bone marrow. The porphyrine excretion pattern of the stools was similar to that in PCT. A secondary protoporphyric hepatopathy could not be diagnosed. The onset of the sickness having taken place in early infancy suggested a possible genetic transmission of still unknown origin. The evaluation of the case is that a new form of porphyria has been encountered, one not yet reported.

8981 A CASE/CONTROL STUDY OF THE ASSOCIATION BETWEEN PRIMARY LIVER CANCER AND HEPATITIS B INFECTION IN SENEGAL. *(E.)* Prince, A. M.; Szmuness, W.; Michon, J.; Demaille, J.; Diebolt, G.; Linhard, J.; Quenum, C.; Sankale, M. (Lindsley F. Kimball Res. Inst., New York Blood Center, 310 East 67 St., New York, N.Y. 10021). *Int. J. Cancer* 16(3):376-383, 1975.

Radioimmunoassay and passive hemagglutination techniques were used to determine the prevalence of hepatitis B surface antigen (HBsAg) and antibody (anti-HBs) in 165 patients with primary liver cancer, in 153 age/sex-matched controls with cancer of other sites, and in 328 age/sex-matched hospitalized controls without cancer. HBsAg was detected in serum from 61.2% of the patients with liver cancer as compared with 11.7% of the controls with other cancers and with 11.3% of the noncancer controls. The frequency of HBsAg in male liver cancer patients was slightly higher than in females (63.0% versus 55.3%). In all groups, a decline in HBsAg prevalence was seen in those older than 50 yr. The prevalence of anti-HBs was lowest in patients with liver cancer; the combined prevalence of HBsAg and anti-HBs in this group was 79.4% as opposed to 57.1% in the controls with other cancers and 53.4% in the noncancer controls. Within the primary liver cancer group, the frequency of HBsAg was significantly higher in patients with α-fetoprotein (72.3%) than in those without α-fetoprotein (40.3%). Liver cancer patients with and without accompanying cirrhosis did not differ in the frequency of HBsAg. No significant difference in history of potential hepatitis exposure was found in the three study groups. These results unequivocally confirm previous studies indicating a specific association between the frequency of HBs antigenemia and primary liver cancer. The possibility that this association may be an expression of an intrinsic oncogenic potential of hepatitis B virus is discussed.

8982 LIVER BIOPSY IN METHOTREXATE-TREATED PSORIATICS—A RE-EVALUATION. *(E.)* Zachariae, H.; Grunnet, E.; Sogaard, H. (Marselisborg Hosp., Univ. Aarhus, Aarhus, Denmark). *Acta Derm. Venereol.* 55(4):291-296, 1975.

Liver biopsies (286) were performed on 139 psoriatics either on treatment or being considered for treatment with methotrexate. Both pre- and post-methotrexate biopsies were performed in 56 cases; the average methotrexate dose was 9.36 mg. No significant differences were noted between pre- and post-methotrexate biopsy specimens, except for slight increase in fatty infiltration found when all pre-methotrexate biopsies were compared with the total number of latest post-methotrexate samples. Alcohol was significantly associated with liver fibrosis in pre-methotrexate biopsies. An increase in liver pathology was noted in patients treated with potassium arsenite and methotrexate. Only 1 of 22 (5%) psoriatics with a total normal biopsy had been on arsenite, but 6 of 18 (33%) of the same group of psoriatics who had fibrosis had been on this drug at an earlier time. In three cases, liver cirrhosis appeared in a biopsy from a methotrexate-treated psoriatic who had no signs of fibrosis or cirrhosis in a pre-methotrexate biopsy. However, this incidence was low in relation to the number of patients treated. It is suggested that this low incidence of cirrhosis results from use of an intermittent dose schedule. The possibility of cirrhosis necessitates performance of liver biopsies in the control of psoriatics on long-term methotrexate therapy. It is concluded that the severity of the disease may be a complicating factor in the pathogenesis of liver damage.

8983 A PROSPECTIVE STUDY OF THE EFFECTS OF WEEKLY ORAL METHOTREXATE ON LIVER BIOPSY. FINDINGS IN SEVERE PSORIASIS. *(E.)* Warin, A. P.; Landells, J. W.; Levene, G. M.; Baker, H. (London Hosp., London, England). *Br. J. Dermatol.* 93(3):321-327, 1975.

Methotrexate (MTX) toxicity was studied in 25 (aged 23-78 yr) patients with severe psoriasis. Liver biopsies were taken before and at intervals after the onset of MTX treatment (intermittent dosage schedule). Most patients received only a single weekly dose. Five patients had some of their treatment in divided doses over 24 hr each week and two patients had all their MTX by this regimen. No tendency toward hepatopathy was found. Four patients exhibited a mild inflammatory cell infiltrate and a mild fibrosis was seen in two patients before treatment. During treatment only one developed a grade 2 infiltrate and one other, a grade 2 fibrosis; none developed cirrhosis. Fluctuations in the degree of inflammation and fibrosis were observed. It is suggested that some of the hepatotoxicity reported previously may be attributable to the daily dose schedule and the failure to detect patients with abnormal liver histology before treatment.

8984 RENAL TUBULAR ACIDOSIS IN CHRONIC LIVER DISEASE. *(E.)* Golding, P. L. (Royal Portsmouth Hosp., Portsmouth, Hants, England). *Postgrad. Med. J.* 51(598):550-556, 1975.

An extension of a previous systematic study determining the prevalence and nature of distal tubular acidification defects in patients (117) with chronic liver disease is reported. Overt renal tubular acidosis was diagnosed in those patients who had a metabolic acidosis and whose urine pH was 6 or greater. Incomplete acidosis was detected *via* ammonium chloride and calcium chloride acid loading tests. The highest incidence of incomplete and overt renal tubular acidosis was found in patients with primary biliary cirrhosis and/or active chronic hepatitis; in all, 32% (38 patients) had a tubular defect. Patients with overt acidosis presented with symptoms of polydypsia, polyuria, muscular weakness, nausea and vomiting. Hypokalemia occurred in 7 of 11 patients with overt acidosis and osteomalacia was seen in two patients. Proteinuria occurred in ten patients with either the incomplete or overt forms and nephrocalcinosis was observed in two patients. There were no correlations between the globulin level or serum copper and the absence, presence, or type of acidosis. Qualitative changes in the pattern of acid excretion were noted in many patients with acidifying defects, while no substantial abnormalities in creatinine clearance were observed. The presence of renal tubular acidosis could not be significantly associated with abnormal levels of IgA, IgG, IgM, or with any particular autoantibody. Renal histology revealed interstitial nephritis, diffuse calcinosis, and minimal glomerular changes. However, in two patients, immunofluorescent techniques showed linear staining of the basement membrane due to antibody deposition. The possibility that cell-mediated immune mechanisms might be responsible for the tissue damage and the tubular defect was tested using the leukocyte migration inhibition test. Abnormalities of WBC migration were confined to patients with renal tubular acidosis in the active chronic, primary biliary cirrhosis, and cryptogenic cirrhotic groups. Although the association between renal tubular acidosis and chronic liver disease could be due to multiple factors, immunological mechanisms probably play a major role. The data suggest that electrolyte abnormalities are a result of, rather than the cause of, the renal tubular acidosis.

8985 THE ROLE OF RENIN IN RENAL FAILURE ASSOCIATED WITH HEPATIC FAILURE. *(E.)* Smith, I. K. (King's Coll. Hosp. Medical Sch., Denmark Hill, London S.E.5, England). *Postgrad. Med. J.* 51(598): 506-508, 1975.

A literature review of the role of renin in hepatic failure and in the pathology of renal failure associated with liver disease is presented. Studies employing the development of glycerol-induced renal failure suggest a role of renin in the pathogenesis of circulatory renal failure by the generation of angiotensin I and its subsequent conversion to angiotensin II. Little is known of the intrarenal action of renin; however, no correlation of the progress of renal failure with changes in the renin-angiotensin system has been noted. An increased renal plasma flow resulting from infusions of dopamine in one experiment reversed the elevated plasma renin activity found in association with liver disease, suggesting that plasma renin activity is determined (at least in part) by the renal blood flow. Isolated perfused kidney experiments suggest that renin-substrate depletion is capable of influencing a reduction in intrarenal angiotensin generation. However, it is noted that elevated renin levels in peripheral plasma are equally likely a cause or consequence of reduced renal perfusion. In preliminary studies on the role of the renin-angiotensin system in hepatic and renal failure associated with acute tubular necrosis, no consistent pattern emerged. Venous plasma renin concentration was markedly elevated in all patients studied, yet renal renin secretion was documented only once.

8986 CONSEQUENCES OF ACUTE RENAL FAILURE RELEVANT TO HEPATIC FAILURE. *(E.)* Weston, M. J.; Wilkinson, S. P. (King's Coll. Hosp. and Medical Sch., Denmark Hill, London S.E.5, England). *Postgrad. Med. J.* 51(598):486-488, 1975.

The consequences of renal failure in patients with liver disease are discussed. High blood ammonia levels, amino acid accumulation (resulting in an overspill aminoaciduria), and a rise in plasma octopamine occurred in these patients. Administration of fresh frozen plasma can lead to circulatory overload and pulmonary edema. Factors involved in hemorrhage associated with liver failure include a synthetic defect of coagulation factors, disseminated intravascular coagulation, esophageal varices, and mucosal hemorrhages induced by endotoxins. Infection is an important cause of death in patients with acute renal failure; the causes of infection involve impaired cell-mediated immunity, phagocytic activity, and reticulo-endothelial function. Therapeutic considerations in the management of renal failure are evaluated; these include the use of diuretics, oral neomycin and gentamicin. Hemodialysis with a cuprophane membrane or peritoneal dialysis can efficiently remove ammonia, correct hyponatremia and alkalosis, and correct the uremic syndrome. However, no long-term survivals have been found in cirrhotic patients.

8987 THE QUANTITATIVE DETERMINATION AND PHENOTYPING OF CERULOPLASMIN IN WILSON'S DISEASE. *(Ger.)* Goedde, H. W.; Benkmann, H. G.; Lange, J.; Harders, H. (Institut Humangenetik, Universitat D-2000 Hamburg 54, Butenfield 32, Germany). *Klin. Wochenschr.* 53(15):731-734, 1975.

Horizontal starch gel electrophoresis was used for determining the ceruloplasmin phenotypes of 17 patients (9 males and 8 females) with Wilson's disease and those of 48 of their relatives. Radial immunodiffusion was employed for quantitative determinations of ceruloplasmin and transferrin, and simultaneous determinations were made of the phenotype for the C3 component of complement and for pseudocholinesterase. Controls consisted of 727 normal subjects. The Cp BB phenotype of ceruloplasmin was found in all 17 patients, their 48 relatives, and the 727 controls. Only the UU phenotype for cholinesterase was found; the most common transferrin phenotype was the common CC; and the frequencies for C3 were within normal limits for Central Europeans. No differences in phenotypes were found between patients with Wilson's disease and controls. Quantitative determinations of ceruloplasmin confirmed that there was considerable overlapping between subjects assumed to be heterozygotes and normal controls. With one exception, all patients with Wilson's disease had ceruloplasmin concentrations of 0 to 10 mg/100 ml serum. These concentrations ranged from 12 to 47 mg/100 ml in heterozygotes and from 20 to 62 mg/100 ml in controls. These findings provide no support for the hypothesis that the primary defect in Wilson's disease is a structural and functional abnormality in ceruloplasmin.

8988 FAMILIAL WILSON'S DISEASE: COPPER-INDUCED HEMOLYSIS, HYPERSPLENISM SYNDROME, AND HYPERPIGMENTATION AS THE PRINCIPAL SYMPTOMS.

(Ger.) Steiner, P.; Frey, P.; Lupi, G. A.; Kistler, H. J. (Spital Limittal, CH-8952 Schlieren, Switzerland). *Schweiz. Med. Wochenschr.* 105(27):872-879, 1975.

A 17-yr-old boy was hospitalized with splenomegaly, hyperpigmentation on both lower legs, Kayser-Fleischer rings, and neurological symptoms (tremor, absence of tendon reflexes, slurred speech, and mental retardation). With the exception of slightly increased BSP retention and a significant decrease in serum cholinesterase, liver function tests were initially normal, but laparoscopy showed nodular cirrhosis and moderate signs of portal hypertension. Cirrhosis was not evident in a liver biopsy, but a strongly positive reaction for Cu was obtained and urinary Cu excretion was decreased (212-278 μg/24 hr); ceruloplasmin was not present in the serum. Administration of increasing doses of D-penicillamine to a maximum of 1 g/day, with a low-Cu diet, increased urinary Cu excretion to 2000-3000 μg/24 hr and the corneal rings became paler. However, WBC and platelet counts continued to decrease, the patient's mental state failed to improve, and he had to be hospitalized for drug addiction. After splenectomy, the WBC and platelet counts normalized and the patient's mental condition stabilized. At the last followup, laparoscopy showed nodular cirrhosis with no evidence of portal hypertension, but liver function had deteriorated. The 12-yr-old sister of this patient was hospitalized when she developed jaundice. She had a history of postprandial abdominal pain which was sometimes accompanied by vomiting of bile. She had no psychiatric or neurological symptoms, but her liver was palpable 4 cm below the rib cage and she had Kayser-Fleischer rings. Liver function tests were abnormal, and urinary Cu excretion was decreased to 157 μg/100 ml. Cirrhosis and portal hypertension were diagnosed at laparoscopy. Immediately after institution of D-penicillamine and a low-Cu diet, the patient developed a fever and, after seven days, a hemolytic crisis which appeared to be caused by Wilson's disease rather than the drug. D-penicillamine was later resumed, and the patient has developed no serious complications in 3.5 yr. On the basis of increased urinary Cu excretion after D-penicillamine loading, the 15-yr-old sister of these patients is considered to have presymptomatic Wilson's disease. The parents are asymptomatic. The only abnormalities noted were slight decreases in serum ceruloplasmin and Cu levels in the mother.

8989 WILSON'S DISEASE (HEPATOLENTICULAR DEGENERATION) OF LATE ADULT ONSET: REPORT OF CASE.

(E.) Fitzgerald, M. A.; Gross, J. B.; Goldstein, N. P.; Wahner, H. W.; McCall, J. T. (Mayo Graduate Sch. Medicine, Univ. Minnesota, Rochester, Minn.). *Mayo Clin. Proc.* 50(8):438-442, 1975.

A case of Wilson's disease, in which the onset of symptoms occurred in a male Caucasian at 55 yr of age, is reported. The patient initially complained of malaise and abdominal pain, and experienced persistent anemia. A limited family history of hepatic and neurologic disease was noted, and abdominal examination revealed only a palpable spleen tip. Routine urinalysis, hemoglobin, leukocyte count, platelet count, serum alkaline phosphatase level, serum albumin, and globulin tests all gave values within the normal range. Esophageal varices were demonstrated roentgenologically and a liver scan with Tc-Sc colloid showed small organ size and increased uptake by the reticuloendothelial system of the spleen and vertebrae. Radiocopper studies using carrier-free ^{67}Cu were typical of a homozygous state in Wilson's disease; no incorporation of ^{67}Cu into serum ceruloplasmin, increased urinary excretion of ^{67}Cu, and increased total body retention of the isotope were noted. Despite a therapeutic program of oral D-penicillamine (250 mg, four times daily), a low-copper diet, and vitamin K_5 (4 mg daily), death resulted from hemorrhage from the esophageal varices. At autopsy, the liver copper concentration was 892 μg/g of dry weight, and the renal copper concentration was 81 μg/g. The combination of Kayser-Fleischer rings, low concentration of serum ceruloplasmin, elevated urinary excretion of copper, and marked cupriuresis after D-penicillamine administration supported the diagnosis of Wilson's disease. The late clinical onset and presenting hepatic dysfunction were noted as especially unusual. The necessity of considering Wilson's disease in the differential diagnosis of patients with chronic hepatitis or with cirrhosis of undetermined etiology is emphasized. Suggested screening procedures include determination of serum ceruloplasmin, 24-hr urinary copper excretion, slit-lamp biomicroscopy of the corneas for Kayser-Fleischer rings, liver biopsy, hepatic copper concentration, and a study of copper kinetics.

8990 A CONTROLLED TRIAL OF REPEATED HALOTHANE ANAESTHETICS IN PATIENTS WITH CARCINOMA OF THE UTERINE CERVIX TREATED WITH RADIUM [abstract].

(E.) Trowell, J.; Smith, A. C. (Dept. Med., Univ. Oxford, England). *Gut* 16(5):403, 1975.

8991 A CONTROLLED PROSPECTIVE TRIAL OF THE EFFECT OF MULTIPLE EXPOSURES TO HALOTHANE ON LIVER FUNCTION [abstract].

(E.) Wright, R.; Crampton Smith, A.; Trowell, J.; Chisholm, M.; Hawksley, M.; Eade, O. E.; Lloyd, B.; Edwards, J. C.; Moles, T. M. (Southampton Univ. Hosp., England). *Gut* 16(5):403, 1975.

8992 DEFECTIVE PLATELET FUNCTION WITH DEFICIENCY OF 'STICKY PLATELETS' IN FULMINANT HEPATIC FAILURE [abstract]. *(E.)* Weston, M. J.; Langley, P. G.; Williams, R. (King's Coll. Hosp., London, England). *Gut* 16(5):402, 1975.

8993 QUANTITATIVE ASSESSMENT OF LIVER FUNCTION AND PROGNOSIS USING ^{131}I ROSE BENGAL [abstract]. *(E.)* Triger, D. R.; Gamlen, T. R.; Ackery, D. M.; Fleming, J. S.; Grant, R. W.; Kenny, R. W.; Maciver, A. G.; Wright, R. (Southampton Univ. Hosp., Southampton, England). *Gut* 16(5):400, 1975.

8994 GLUCOGEN AND ATP-CONTENT OF THE LIVER AND THE INFLUENCE OF FRUCTOSE DURING ABDOMINAL OPERATIONS. *(E.)* Stremmel, W.; Koehnlein, H. E.; Neuburger, N. (Dept. Surgery, Univ. Freiburg, Freiburg, Germany). *Bull. Soc. Int. Chir.* 33(5-6):513-518, 1974.

8995 HEPATIC RESECTION. *(E.)* Ong, G. B.; Lee, N. W. (Dept. Surgery, Univ. Hong Kong, Hong Kong). *Br. J. Surg.* 62(6):421-430, 1975.

8996 DEATH FROM HEPATIC FAILURE AFTER JEJUNOILEAL ANASTOMOSIS. *(E.)* Spin, F. P.; Weismann, R. E. (Dept. Surgery, Hitchcock Clinic, Hanover, N.H.). *Am. J. Surg.* 130:88-91, 1975.

8997 THE CONTRIBUTION OF LIVER BIOPSIES TO CLINICAL DIAGNOSIS. *(Nor.)* Nesje, O. A.; Arva, P.; Normann, T. (Baerum Sykehus, Norway). *Tidsskr. Nor. Laegeforen.* 95(6):362-364, 1975.

8998 HEMANGIOMA OF THE LIVER. DIAGNOSIS WITH COMBINED USE OF LAPAROSCOPY AND HEPATIC ARTERIOGRAPHY. *(E.)* Kato, M.; Sugawara, I.; Okada, A.; Kuwata, K.; Satani, M.; Okamoto, E.; Manabe, H. (Osaka Univ. Medical Sch., Osaka City, Osaka, Japan). *Am. J. Surg.* 129(6):698-704, 1975.

8999 LIVER DISEASES ASSOCIATED WITH GASTRIC DISEASE. *(Ger.)* Kleine, F. D.; Liebmann, S.; Friebel, H. (Medizinische Adademie, DDR-201 Magdeburg, Leipziger Str. 44, Germany). *Dtsch. Z. Verdau Stoffwechselkr.* 34(5/6):287-291, 1974.

9000 MULTINUCLIDE EVALUATION OF HEPATIC MASS LESIONS. *(E.)* Koenigsberg, M.; Freeman, L. M. (Albert Einstein Coll. Medicine, Bronx, N. Y.). *CRC Crit. Rev. Clin. Radiol. Nucl. Med.* 6(2):113-152, 1975.

9001 ULTRASTRUCTURE OF LIVER-BIOPSY TISSUES FROM REYE'S SYNDROME. *(E.)* Watanabe, W.; Ohkawa, K.; Kobayashi, O. (Niigata Univ, Sch. Medicine, Niigata, Japan). *Nihon Rynsho Denshi Kenbikyo Gakkai-Shi* 7(3-4): 359, 1975.

9002 THE CARBON-TETRACHLORIDE-HEPATOTOXICITY AS A MODEL OF LIVER DAMAGE. FIRST REPORT: LONG-TIME BIOCHEMICAL CHANGES. *(E.)* Paquet, K. J.; Kamphausen, U. (Dept. Surgery, Univ. Bonn, Bonn, Germany). *Acta Hepatogastroenterol.* 22(2):84-88, 1975.

9003 DIAGNOSIS OF LIVER LESIONS IN AMYLOIDOSIS. *(Rus.)* Podymova, S. D.; Zolotarevsky, V. B.; Nasonov, E. L. (Dept. of Therapy and Pathological Anatomy, I. M. Sechenov First Moscow Medical Institute, USSR). *Ter. Arkh.* 47(2):67-71, 1975.

9004 HEPATIC REACTION IN ULCERATIVE COLITIS AND CROHN'S DISEASE. *(Ger.)* Morl, M. (Medizinische Universitatsklinik mit Poliklinik, 852 Erlangen, Krankenhausstrasse 12, Germany). *Med. Klin.* 70(15): 670-673, 1975.

9005 CONSIDERATIONS ON A CASE OF MICROANGIOMATOSIS OF THE LIVER. *(It.)* Galluzzo, A.; Lo Guzzo, R.; Gassi, Jr., G. B.; Amarisse, C. (Ospedale Riuniti, Roma, Italy). *Chir. Gastroenterol.* 8(4):468-473, 1974.

9006 GRANULOCYTE ALKALINE PHOSPHATASE ACTIVITY IN PATIENTS TREATED WITH X-RAYS FOR BREAST CARCINOMA. *(Pol.)* Sochacka-Kuzko, B.; Urasinski, I.; Meyer, A. (Clinic of Hematology, Polish Acad. of Medical Sciences, Szczecin, Poland). *Pol. Tyg. Lek.* 30 (8):349-352, 1975.

9007 CLINICAL EVALUATION OF TOMOGAMMAGRAPHY IN THE STUDY OF HEPATIC LESIONS. *(Sp.)* Legaz, A. M.; Gonzalez, M. E. G.; Garcia, F. S.; Jimenez, L. D.; Romero, J. L. C.; Berrocal, J. O. (Servicio Medicina Nuclear, Clinica Puerta de Hierro, Madrid, Spain). *Rev. Clin. Esp.* 135(3):231-236, 1974.

9008 BIO- AND HISTOENZYMATIC METHODS OF INVESTIGATION IN ESTIMATING THE LIVER STATE IN TEMPORARY COMPRESSION OF THE HEPATO-DUODENAL LIGAMENT. *(Rus.)* Pogorelov, I. F.; Mal'tsev, E. V. (Dept. of Surgery and Topographic Anatomy, N. I. Pirogov Odessa Medical Inst., USSR). *Vestn. Khir.* 114(5):50-54, 1975.

9009 CLINICAL PICTURE AND OUTCOME OF INFLAMMATORY PROCESS IN THE BILIARY SYSTEM IN THE NEWBORN. *(Rus.)* Bryskina, V. I. (Sverdlovsk Scientific Res. Inst. of Maternity and Child Care, Ministry of Public Health of the Russian SSR, USSR). *Pediatriia* (5):71-73, 1975.

9010 THE VALUE OF DETERMINING SERUM CHOLINESTERASE ACTIVITY IN EVALUATING LIVER FUNCTION. *(Ser.* Straus, B.; Vasilj, L.; Plasaj, M.; Stefanovic, R.; Zadro, I.; Wurth, G. (Military Hosp., Zagreb, Yugoslavia). *Vojnosanit. Pregl.* 32(2):117-119, 1975.

9011 ORNITHINE TRANSCARBAMYLASE DEFICIENCY IN REYE'S SYNDROME [abstract]. *(E.)* Snodgrass, P. J.; DeLong, G. R. (Indiana Univ. Sch. Med., Indianapolis, Ind.). *Gastroenterology* 68(4): 1085, 1975.

9012 HEPATIC CHANGES IN MORBID OBESITY, AND AFTER JEJUNOILEAL BYPASS [abstract]. *(E.)* Marubbio, A. T.; Buchwald, H. (Hennepin County Med. Center, Minneapolis, Minn.). *Gastroenterology* 68(4): 1080, 1975.

9013 SIGNIFICANCE OF ELEVATED LIVER ALKALINE PHOSPHATASE IN SERUM [abstract]. *(E.)* Kaplan, M. M.; Brensilver, H. L. (Tufts-New England Med. Center, Boston, Mass.). *Gastroenterology* 68(4): 1078, 1975.

9014 PRIMARY INTRAHEPATIC STONES DIAGNOSED BY ERCP [abstract]. *(E.)* Johnson, L. F.; Walta, D. C. (Tripler Army Med. Cent., Honolulu, Hawaii). *Gastroenterology* 68(4):1049, 1975.

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9051 ACUTE EFFECT OF ORAL ETHANOL ON BROMSULPHALEIN (BSP) TRANSPORT RATES IN HEALTHY HUMANS WITH DIFFERENT DRINKING HABITS [abstract]. *(E.)* Safavi, S. S.; Raichlen, J. S.; Weiss, J. B.; Long, W. B.; Marin, G. A. (Dept. Med., Univ. Pennsylvania, Philadelphia, Pa.). *Clin. Res.* 23(3):255A, 1975.

9052 GENERALIZED CALCIFICATION OF THE LIVER IN ADVANCED SCHISTOSOMIASIS JAPONICA--A CASE REPORT. *(E.)* Okuda, K.; Jinnouchi, S.; Arakawa, M.; Nitta, A.; Nakashima, T. (Univ. Sch. Medicine, Chiba, Japan). *Acta Hepatogastroenterol.* 22(2):98-102, 1975.

9053 REYE'S SYNDROME. REPORT OF CASES AND A REVIEW OF LITERATURE. *(E.)* Simmons, R. E.; Reddy, J. K. (Dept. Pediatrics, KUMC, Kansas City, Kansas 66103). *J. Kans. Med. Soc.* 76(6):119-124, 1975.

9054 ACUTE FATTY LIVER OF PREGNANCY. REPORT OF A CASE. *(Fr.)* Leverger, J. C.; Ramee, M. P.; Gueguen, C.; Guillouzo, A.; Thomas, R.; Chevet, D. (Inserm U-49, Hopital Pontchaillou, Rennes, France). *Arch. Fr. Mal. App. Dig.* 64(2):145-151, 1975.

9055 STUDIES ON THE TOXICITY OF MONOBROMOTHRICHLOROMETHANE (CBrCL$_3$) [abstract]. *(E.)* Gabriel, L.; Burdino, E.; Torrielli, M. V.; Ugazio, G. (Istituto di Patologia Generale dell' Universita, Torino, Italy). *Rend. Gastroenterol.* 6(3):212, 1974.

9056 HEXOKINASE ISOZYME IN HUMAN LIVER: ALTERED ISOZYME DISTRIBUTION AMONG LIVER DISEASES [abstract]. *(E.)* Ueda, M.; Taketa, K.; Shimamura, J.; Kosaka, K. (Okayama Univ. Med. Sch., Okayama, Japan). *Clin. Res.* 23(3):259A, 1975.

9057 HEPATIC ULTRASTRUCTURAL CHANGES IN VINYL-CHLORIDE (VC) WORKERS [abstract]. *(E.)* Triche, T.; Nanba, K.; Ishak, K.; Wolkoff, A.; Berk, P. D. (Natl. Inst. Health, Bethesda, Md.). *Clin. Res.* 23(3):259A, 1975.

9058 PRIMARY LIVER CANCER WITH AND WITHOUT CIRRHOSIS. A REVIEW OF 50 CASES. *(Sp.)* Hernandez-Guio, C.; Morono, E.; Ojeda, C.; Sarasa, J. L. (Fundacion "Jimenez Diaz," Univ. Autonoma, Madrid, Spain). *Rev. Clin. Esp.* 135(5):455-462, 1975.

9059 SHORT CHAIN FATTY ACIDS (SCFA) IN REYE'S SYNDROME (RS) [abstract]. *(E.)* Varma, R. R.; Cheravil, G.; Casper, J. T.; Lewis, J. D.; Harrington, G.; Parker, H. W. (Med. Coll. of Wisconsin, Milwaukee, Wis.). *Gastroenterology* 68(4):1086, 1975.

See also, 8227, 8232, 8425, 8426, 8438, 8439, 8440, 8446, 8447, 8448, 8449, 8454, 8456, 8458, 8466, 8467, 8471, 8473, 8524, 8531, 8565, 8576, 8670, 9078, 9108, 9118, 9162, 9166, 9167. 9189, 9206, 9219, 9234, 9291, 9305, 9313, 9319, 9386.

LIVER AND BILIARY TRACT

Hyperbilirubinemic States

9060 HYPERBILIRUBINAEMIA AND BACTERIAL INFECTION IN THE NEWBORN: A PROSPECTIVE STUDY. *(E.)* Anonymous. (No affiliation given). *Arch. Dis. Child.* 50(8):652-653, 1975.

The incidence of bacterial infection associated with unexplained hyperbilirubinemia was determined prospectively in 69 preterm and term infants under two wk of age. Hyperbilirubinemia was defined as being characterized by a serum bilirubin level above 5 mg/dl on day 1, 10 mg/dl on day 2, or 12 mg/dl on any day thereafter. Criteria for infection were any bacterial isolate from blood, suprapubic aspirated urine, CSF (cultured from 22 infants), or 10^5 organisms/mm^3 from a clean-voided urine specimen. Gram-negative bacterial infection was detected in only 3% of the infants (2 of 69); neither patient had direct bilirubin greater than 0.4 mg/dl. The results indicate that urinary tract infections in the first week of life can be associated with jaundice, but the data are insufficient to document a cause-effect relation.

9061 THE DUBIN JOHNSON SYNDROME. *(E.)* Singh, D. S.; Sama, S. K.; Lal, K. (All-India Inst. Medical Sciences, Ansari Nagar, New Delhi-16, India). *J. Assoc. Physicians India* 23(4):277-281, 1975.

Nine cases of Dubin Johnson syndrome are described. The primary clinical signs were chronic, benign, persistent, or recurrent jaundice associated with upper abdominal ache, fatigue, and mild to moderate hepatomegaly. Icterus was noted as being due to intercurrent illness or stress. Values for hemogram, platelet count, and reticulocyte count, as well as bleeding, clotting, and prothrombin times, were generally normal. However, liver function tests showed total serum bilirubin values of 1.8 to 6.8 mg%, conjuagted bilirubin values of 1.2 to 3.4 mg%, total serum protein values of 6.4 to 7.9 g%, serum albumin values of 3.4 to 4.4 mg%, alkaline phosphatase values of 6.0 to 34 K.A.U., and SGOT/SGPT values of 0.77 to 2.16 μM-U-hr. Biliary passages and the gallbladder were frequently not visualized on peroral and i.v. cholangiograms; liver biopsies were consistently necessary for the diagnosis of Dubin Johnson syndrome. Dubin Johnson syndrome is frequently unrecognized in northern India.

9062 LIPOPROTEIN X (LP-X) IN PROLONGED JAUNDICE IN PREMATURE INFANTS. *(It.)* Vierucci, A.; Monterisi, N.; Petriccioli, G.; Bougleux, T.; Andreini, C. (Clinica Pediatrica, Universita Firenze, Italy). *Riv. Clin. Pediatr.* 86(2/3):85-88, 1973.

Lipoprotein-X (LP-X), leucine aminopeptidase (LAP), γ-glutamyl transaminase (γ-GT), alkaline phosphatase, SGOT, SGPT, lipoproteins, total cholesterol, and triglycerides were determined in blood from 34 premature infants with jaundice of longer than four days duration and total bilirubin concentrations of more than 10 mg/100 ml. Group one consisted of seven infants with direct bilirubin concentrations of more than 1 mg/100 ml, while group two consisted of 27 in whom serum bilirubin was present only in indirect form. While no positive tests for LP-X were obtained on sera from infants in group two, positive tests for LP-X were found in four of the seven infants in group one. These findings contrast with those obtained in adults with cholestasis, all of whom have positive tests for LP-X. The absence of LP-X in some of these infants may be due to a deficiency of apolipoprotein C in premature infants or to an impairment of some physiochemical mechanisms involved in the aggregation of plasma proteins and lipids which constitute the antigenic complex known as LP-X. The activities of enzymes implicated in cholestasis (LAP, γ-GT, and alkaline phosphatase) were increased in these infants, but SGOT and SGPT activities were unchanged. Although serum cholesterol levels were increased in only one of the seven infants in group one, serum triglyceride levels were above the upper normal limit of 130 mg/100 ml in five of the seven. Immunoelectrophoresis showed an abnormal increase in lipoprotein in the β region, and precipitation lines for α-lipoproteins appeared irregularly. These findings suggest that the synthesis of peptides constituting apolipoprotein A is impaired in cholestasis and that peptide synthesis probably occurs asynchronously with changes in the assembly mechanism.

9063 FREE FATTY ACIDS AND UNCONJUGATED HYPERBILIRUBINAEMIA [abstract]. *(E.)* Cowan, R. E.; Kaye, J.; Thompson, R. P. H. (St. Thomas' Hosp., London, England). *Gut* 16(5):399, 1975.

9064 BSP METABOLISM AND TRANSPORT IN ROTOR'S SYNDROME [abstract]. *(E.)* Wolpert, E.; Wolkoff, A. W.; Pascasio, F.; Arias, I. M. (Nat. Institute of Nutr., Mexico City, Mexico). *Gastroenterology* 68(4):1067, 1975.

LIVER AND BILIARY TRACT

Nonviral Hepatitis and Hepatic Injury

9065 DIAGNOSIS OF DRUG-INDUCED ALLERGIC HEPATIC DISORDERS. *(E.)* Monna, T.; Enomoto, T.; Mizoguchi, Y. (Osaka City Univ. Medical Sch., Osaka, Japan). *Asian Med. J.* 18(3):29-32, 1975.

The incidence and diagnosis of drug-induced allergic liver disorders are discussed. The symptoms of such disorders include: fever, eruption, eosinophilia, and itching followed by jaundice, as well as a pattern of intrahepatic cholestasis. A certain drug may produce hepatic disorders in only a small number of people, and the severity and appearance of symptoms are variable and unrelated to drug dosage. Between 1945 and 1972, 2637 cases of drug-induced hepatic disorders were reported in Japanese medical journals: 554 cases were due to antituberculosis drugs, 428 were due to psychotropic agents, 357 were related to antibiotics, 314 were related to drugs acting on the circulatory system, 228 were food-related, 111 were caused by thorium dioxide, 106 were due to anabolic steroid hormone administration, 90 were caused by antipyretic, analgetic and anti-inflammatory agents, and 86 were caused by anti-neoplastic preparations. The number of cases increased yearly, as did the variety of drugs involved. The diagnosis of a drug-induced allergic hepatic disorder involves the use of an *in vitro* test in which sensitized patient lymphocytes come into contact with the drug, producing a chemical mediator such as a macrophage migration inhibitory factor. From a morphological standpoint, a blastoid transformation in the lymphocytes is also noted. Because these tests generally require a large quantity of blood, changing the concentration of the suspected drug and the use of microvolumes of peripheral blood for repeated examinations represent improvements. Histological findings in the liver are classified as cholestatic, cytotoxic, and mixed type. The histological findings are not consistent for a particular drug. This problem deserves the attention of clinicians in that the majority of drug-induced allergic hepatic disorders are produced by medical products.

9066 THE ISOENZYME PATTERN OF LACTATE DEHYDROGENASE FOLLOWING CHOLECYSTECTOMY PERFORMED WITH HALOTHANE ANESTHESIA. *(Ger.)* Klar, H.; Lundstrom, J.; Mollerberg, H.; Persson, G.; Ygge, H. (Regional Hosp., Skelleftea, Sweden). *Anaesthesist* 23(10):417-420, 1974.

Total serum LDH and serum LDH isoenzyme activities were determined for 51 patients who underwent uncomplicated cholecystectomy. Determinations were made on blood samples taken before surgery, immediately after discontinuation of anesthesia, and the first day after surgery. None of these patients had biliary inflammation or choledocholithiasis. The main anesthetic administered was halothane in 15 cases; methoxyflurane in 17; and other general anesthetics, (e.g., a thiopental/meperidine combination) in 19. Although LDH$_5$ activity was somewhat higher ($p > 0.05$) before surgery in the group of patients receiving halothane, no differences in total serum LDH activity were found among these three groups of patients. However, one day after surgery, total serum LDH activities were increased in patients receiving other general anesthetics ($p > 0.01$) and those receiving halothane ($p < 0.05$). Immediately after surgery, the activities of LDH$_1$-LDH$_3$ were decreased in all three groups but normalized on the day after surgery. Immediately after surgery, the LDH$_4$ activity was increased in all three groups; the next day the activity of this fraction had increased still further in patients given halothane and those receiving other general anesthetics ($p < 0.001$), while normal values were found in patients given methoxyflurane. Immediately after cholecystectomy, LDH$_5$ activities were significantly increased ($p < 0.001$) in all three groups of patients. This increase was about three times greater in patients given halothane than in the other two groups ($p < 0.005$). The day after surgery, the activity of the LDH$_5$ fraction was still about 25% higher in the halothane group than in the other two groups. These findings tend to confirm the theory that increases in the LDH$_5$ activity can be interpreted as a manifestation of liver injury initiated by halothane.

9067 ANICTERIC LIVER DAMAGE DURING NITROFURANTOIN MEDICATION. *(E.)* Klemola, H.; Penttila, O.; Runeberg, L.; Tallqvist, G. (Maria Hosp., SF-00180 Helsinki 18, Finland). *Scand. J. Gastroenterol.* 10(5):501-505, 1975.

Four women are described (aged 60-85 yr) in whom anicteric hepatitis appeared to be related to prolonged nitrofurantoin therapy (100 mg/day for 14 wk to 18 months). All four patients had increased serum transaminase levels, hypergammaglobulinemia, and liver biopsies suggestive of chronic active hepatitis. Features considered typical for this disorder were: infiltration of portal tracts by mononuclear cells and, to a lesser extent, by eosinophilic polymorphonuclear cells; piecemeal necrosis; and irregularity of the lobular margins with swollen liver cells surrounded by inflammatory cells. Three biopsies also showed cirrhotic features including penetration of lobuli by fibrous septa. Immunoelectrophoresis of serum proteins revealed the presence of an albumin-immunoglobulin G complex in two patients. The serum transaminases returned to normal within weeks after withdrawal of the drug, but the hypergammaglobulinemia and the liver biopsy findings persisted essentially unchanged during two to six months of observation. One patient was rechallenged with nitrofurantoin, which resulted in recurrence of elevated serum transaminases after nine wk of medication. These results indicate that long-term administration of nitrofurantoin in moderate doses may cause or trigger chronic hepatitis in susceptible persons with normal kidney function.

9068 ACUTE LIVER DISEASE AFTER CUTANEOUS THERMAL INJURY. *(E.)* Czaja, A. J.; Rizzo, T. A.; Smith, W. R., Jr.; Pruitt, B. A., Jr. (U.S. Army Inst. Surgical Res., Brooks Army Medical Center, Fort Sam Houston, Texas). *J. Trauma* 15(10):887-894, 1975.

Acute liver disease after cutaneous thermal injury was investigated in 81 (63 men and 18 women, average age 33.9 yr) patients, burned one week or less before admission, over an eight month period. SGOT, SGPT, alkaline phosphatase, lactic dehydrogenase, total and conjugated bilirubin, albumin, and total serum protein levels were determined by the multichannel auto-analyzer. The diagnosis of liver disease was made clinically only in patients who had either elevated SGOT and SGTP levels, or who had hepatomegaly and abnormal elevations of all serum enzymes. Patients with liver disease had a larger mean burn size and greater mortality than patients with normal liver studies. Burn size ranged from four to 96% of the body surface. Mortality within the study population reached 47%. Clinical and laboratory evidence of acute liver injury was present in 58% of the patients; the mean age of this group was 32.7 yr, the mean burn size was 57.9%, and the mortality rate was 74.5%. Four patterns of serum abnormality were found: 1) abnormal transaminase elevation (ATE) without hyperbilirubinemia (22 patients), 2) ATE with early hyperbilirubinemia (6 patients), 3) ATE with early jaundice (8 patients), and 4) late onset of conjugated hyperbilirubinemia and jaundice (11 patients). Enzyme patterns revealing acute hemolysis and hepatocellular injury characterized the early postburn period. The magnitude of initial enzyme derangement did not distinguish the survivors, but jaundice was associated with poor prognosis (90% of the jaundiced patients died). The early occurence of hepatocellular injury suggests that acute hemodynamic alterations are important etiologically. Intrahepatic cholestasis and jaundice developed later in septic or hypoxic patients. Infusion of ATP and of human growth hormone support the metabolic needs of the burned patient and may minimize hepatocellular injury and accelerate recovery.

9069 HEPATOCELLULAR DAMAGE IN SCARLET FEVER. *(Pol.)* Granicki, O.; Kempa, E.; Szaflik, H. (Silesian Acad. Medicine, ul. Roosevelta 49, Bytomiu, Poland). *Pediatr. Pol.* 50(5):607-610, 1975.

9070 COMBINATIONS OF ANTIBIOTICS AND ANTIBACTERIAL AGENTS IN TREATMENT OF TUBERCULOSIS WITH SPECIAL EMPHASIS ON THE PROBLEM OF LIVER INJURY. *(It.)* Bettini, L.; Foddai, G.; Giaconi, G.; Pontiggia, P.; Foddai, A. (Ospedale Regionale Specializzato Tisiopneumologia s "E. Morelli," Sondalo, Italy). *Ann. Med. Sondalo* 21(2):67-110, 1973.

9071 CONCERNING HEPATIC LEAD INTOXICATION. CLINICAL AND EXPERIMENTAL STUDY. *(Fr.)* Morel, J. J.; Albahary, C.; Berry, J. P.; Galle, P.; Ripault, J.; Auriol, M.; Desoille, H.; Philbert, M. (Institut d'Hygiene Industrielle et de Medecine du Travail, 15, rue de l'Ecole de Medecine, 75006 Paris, France). *Arch. Mal. Prof. Med. Trav. Secur. Soc.* 35(6):609-630, 1974.

9072 PATHOPHYSIOLOGICAL SHIFTS IN LIVER INJURIES AND SURGERY. *(Rus.)* Borovkov, S. A. (Faculty Clinic Surgery, Ivano-Frankovsk Medical Inst., USSR). *Khirurgiia* (1):87-91, 1975.

9073 CONDITION OF INTRAHEPATIC BLOOD CIRCULATION IN DICHLORETHANE POISONING. *(Rus.)* Petrova, L. I.; Galkina, G. S. (Dept. of Therapy of Acute Poisonings, N. V. Sklifosovskiy Inst. of First Aid, Moscow, USSR). *Ter. Arkh.* 47(2):100-103, 1975.

9074 LIVER PATHOLOGY AND DRUGS. *(Rus.)* Tareev, E. M.; Semendyeva, M. E.; Mukhin, A. S.; Rozanova, L. B.; Blinkov, I. L.; Besprozvannyi, B. K. (no affiliation given). *Ter. Arkh.* 47(5):58-67, 1975.

9075 RHEOHEPATOGRAPHY IN THE DIAGNOSIS OF TOXICOCHEMICAL LESIONS OF THE LIVER IN PERSONS DEALING WITH TETRAMETHYLTHIURAM-DISULPHATE (TMTD). *(Rus.)* Kaskevich, L. M. (Inst. of Hygiene and Toxicology of Pesticides, Polymers and Plastic Materials, Kiev, USSR). *Gig. Tr. Prof. Zabol.* (6):16-19, 1975.

See also, 8982, 9109, 9113.

LIVER AND BILIARY TRACT

Acute Viral Hepatitis

9076 VIRAL HEPATITIS IN THE UNITED STATES, 1970-1973: AN ANALYSIS OF MORBIDITY TRENDS AND THE IMPACT OF HBsAg TESTING ON SURVEILLANCE AND EPIDEMIOLOGY. *(E.)* Bryan, J. A.; Gregg, M. B. (Center for Disease Control, Public Health Service, Dept. Health, Ed., Welfare, Atlanta, Ga.). *Am. J. Med. Sci.* 270(2):271-282, 1975.

An analysis of the morbidity and mortality data of viral hepatitis cases in the United States collected between 1970 and 1973 was presented. The report revealed a plateauing of case rates, no associated seasonal variation, a general geographic case distribution without urban or rural dominance, and the persistence of the highest rates in males 15-29 yr of age. HBsAg testing revealed that 24% of the hepatitis B cases may be misdiagnosed and that hepatitis B caused between 18% and 46% of all reported hepatitis. Thus, hepatitis B may account for as many as one-fifth to one-half of the viral hepatitis cases reported. Close personal contact was responsible for most cases of HBsAg-negative hepatitis. Parenteral drug abuse and blood transfusion were of continued importance in the dissemination of hepatitis B, but hepatitis B accounted for only one-half of all reported transfusion-associated hepatitis. Fatality rates for reported cases averaged 0.8% and appeared to increase with age. There was no difference in rates between HBsAg-positive and negative patients.

9077 THE EPIDEMIOLOGY OF VIRAL HEPATITIS: AN OVERVIEW. *(E.)* Mosley, J. W. (University of Southern California Sch. of Medicine, Los Angeles, Calif.). *Am. J. Med. Sci.* 270(2):253-270, 1975.

A summary of the epidemiologic data of viral hepatitis is presented, based on recent research and worldwide statistics. Hepatitis A virus (HAV) seems to be maintaining itself in human populations *via* serial propagation *vs* a carrier reservoir. The carrier intestinal state is epidemiologically unimportant, and there is no proof of viremic carriers. The epidemics reported from Greenland and Denmark point to lack of endemic transmission. The fecal-oral route is the usual mode of transmission, with other modes accounting for only small percentages of the cases. Distribution of HAV appears to be worldwide and evidence suggests a close relation among geographically unrelated strains. The epidemiologic characteristics include: 1) a cyclic tendency; 2) age-specific attack rates with the young at highest risk; 3) seasonal cycles; 4) higher rates in rural areas; 5) high secondary attack rates among household members; 6) reduced incidence with gamma globulin use; and 7) low case-fatality rates. No proof exists for a hyperendemicity pattern. Long-term incidence appears to show a downward trend. Hepatitis B virus (HBV) shows a high prevalence worldwide. Possible extra-human reservoirs exist, as evidenced by acute and chronic HBV infections induced in chimpanzees. A carrier state is present in at least 5 to 10% of the infected. Subtle percutaneous transmission of HBV beyond the more overt forms, such as transfusion, have been identified. Possible insect vectors are under investigation. Secondary cases occur much less than with type A, and risk is low except for the infected person's close contacts. Fecal-oral, oral-oral, and sexual transmission also seem likely. The long-term trend of HBV is not so well defined as for HAV; however, the higher incidence in the 15 to 24 yr age group appears to be related to recent increases in illicit self-injection, and this may place the nonabuser population at risk. In addition, the distribution of incubation periods of HAV and HBV is not the expected bimodal curve, which suggests that a third viral type may be involved.

9078 LIVER DISEASE IN NONPARENTERAL DRUG ABUSERS. *(E.)* Cooper, A. D.; Niejadlik, D.; Huston, K. (United States Air Force Medical Center and Special Treatment Center, Lackland Air Force Base, Tex.). *JAMA* 233(9):964-966, 1975.

The incidence and severity of liver abnormalities were studied in 500 servicemen with a history of drug abuse, and the possible association of nonparenteral drug use with hepatitis was investigated. Liver function tests were performed on the men, who were between 17 and 25 yr old. Of the 500 men, 407 had used drugs in Southeast Asia (SEA group). Of those in the SEA group, 362 denied parenteral abuse; of the 93 in the non-SEA group, 70% denied needle use. The main forms of drug abuse in the nonparenteral group were sniffing and smoking heroin, and marijuana smoking. The most commonly abnormal liver function test was the SGOT. Needle users had a high incidence of SGOT elevation (71% of the SEA group and 56% of the non-SEA group). Of the 362 nonparenteral users in the SEA group, 42% had elevated SGOT; of the 93 nonparenteral users in the non-SEA group, 40% had SGOT elevation. Eight patients had a positive test for hepatitis B surface antigen (HBsAg), with an overall frequency of 1.6%. All of these positive tests were from the SEA group. The fact that most HBsAg-positive patients denied needle exposure suggests either that the histories were inaccurate or that the subjects had acquired the infection by the nonparenteral route. The latter explanation is favored. Alkaline phosphatase was abnormal in 14%. All but two of these had an abnormal SGOT level. The inclusion of further tests did not seem to add significantly to the sensitivity of case findings provided by the SGOT values. Eighteen of 34 liver biopsy specimens were read as classic viral hepatitis. Fifteen specimens showed a wide array of morphological changes with no consistent pattern. At follow-up tests three months later, 35 men responded for tests; of these, 30 still showed abnormal SGOT values. The elevated SGOT value in over 40% of a large group of nonparenteral drug abusers had not been previously noted. That this abnormality is a result of drug abuse and not of residence in SEA is suggested by the similar incidence among patients not in SEA. The finding of a high incidence of hepatitis in a military community of nonparenteral drug abusers may have important implications for civilian physicians.

9079 A LARGE FOOD-BORNE OUTBREAK OF HEPATITIS A: POSSIBLE TRANSMISSION VIA OROPHARYNGEAL SECRETIONS. *(E.)* Levy, B. S.; Fontaine, R. E.; Smith, C. A.; Brinda, J.; Hirman, G.; Nelson, D. B.; Johnson, P. M.; Larson, O. (Minnesota Dept. Health, 717 Delaware St. SE, Minneapolis, Minn. 55440). *JAMA* 234(3):289-294, 1975.

A large, food-borne outbreak of hepatitis A is reported. Between April 6 and 22, 1974, 12 cases of hepatitis A were reported to the Minneapolis Health Department. Seven of the cases were among the 500 employees of the same department store; and at least five persons had eaten in the store's basement restaurant, in which the earliest case worked as a sandwich maker. The patients' clinical data were reviewed, and a questionnaire covering clinical and epidemiologic information was administered to the affected patients, the unaffected store employees, and 90 employees of a nearby store who had eaten in the store in question after February 1. A follow-up study was conducted to determine the secondary attack rate among household contacts of the patients and to determine the duration of illness. Of a total of 163 cases of hepatitis A reported between April 16 and May 24, 1974, 106 had illness associated with having eaten at the department store ten days to eight wk before the onset of symptoms. The median duration of illness in these 106 patients was 54 days, the median absence from work or school was one month, and none of the patients were positive for hepatitis B surface antigen (HBsAg) or anti-HBs. The median age of the patients was 34 yr and 2/3 were female. Illness was statistically associated with having eaten lunch at the department store restaurant; illness was also statistically associated with frequency of eating cold sandwiches, particularly those containing lettuce. The data of onset of illness in the sandwich-maker index patient and the dates of food consumption and onset of illness of the restaurant patrons were consistent with the accepted periods of infectivity and incubation for hepatitis A. The index patient had generally good hygiene except that she frequently put her hands to her face and mouth during working hours. There were five secondary cases of hepatitis A, the secondary attack rate being much lower among household contacts who received immune serum globulin than among those who did not. It is likely that the primary outbreak was related to the contamination of food with infectious oropharyngeal secretions by the index subject. The immune serum globulin treatments probably prevented some secondary cases among the household contacts of the original patients.

9080 SEROLOGIC EVIDENCE FOR HEPATITIS B VIRUS INFECTION IN PATIENTS WITH HEMOPHILIA B: A MULTICENTER STUDY.

(E.) Hoofnagle, J. H.; Aronson, D.; Roberts, H. (Div. Blood Blood Prod., Bureau Biol., Food Drug Admin., Bethesda, Md.). *Thrombos. Diathes. Haemorrh.* 33(3):606-609, 1975.

To study factors which may contribute to the development of hepatitis following multiple factor IX transfusions, the prevalence of hepatitis B surface antigen (HB_sAG), antibody to HB_sAg (anti-HB_s), and antibody to hepatitis B core antigen (anti-HB_c) was studied in sera from 160 hemophilia B patients from 9 centers in Europe, North America, and South America and in 28 separate lots of commercially prepared factor IX concentrate from 7 different manufacturers. HB_sAg was determined by radioimmunoassay, anti-HB_s by passive hemagglutination, and anti-HB_c by complement fixation. Of the 160 patients, 2.5% were positive for HB_sAg, 60% were positive for anti-HB_s, and 31% were positive for anti-HB_c; a total of 66% were positive for at least one of these factors. There was a positive correlation between the clinically assessed severity of the bleeding tendency and evidence of hepatitis B virus infection. The rate of serologic positivity also appeared to be positively correlated with patient age. The rates of HB_sAg, anti-HB_s, and anti-HB_c positivity in the patients with hemophilia B indicated a fairly uniform high rate of infection which was not dependent upon country of origin or source, manufacturer, or method of preparation of the factor IX concentrate used. It is doubtful that plasma donor screening will be totally successful in preventing contamination of commercially-prepared factor IX concentrate with hepatitis B virus.

9081 SOME EPIDEMIOLOGICAL AND CLINICAL ASPECTS OF HEPATITIS B ANTIGEN AND ITS SUBTYPES.

(E.) Nordenfelt, E. (Dep. Med. Microbiol., Univ. Lund, Sweden). *Scand. J. Infect. Dis.* 7(2):147-152, 1975.

The Australia or hepatitis B antigen (HBAg) and its subtypes are reviewed with respect to their epidemiology and the clinical aspects of the hepatitis associated with each. HBAg is a useful tool for epidemiological studies of hepatitis B, and a close association between this antigen and the infectious agent of hepatitis B is clear. However, it appears that all HBAg carriers are not necessarily carriers of the infectious agent. Of the 3 types of particles found in the serum of hepatitis B patients and carrier, the so-called Dane particles are present in large quantities in sera known to be infectious. The Dane particles consist of an outer coat which exhibits HBAg reactivity and an inner core which is antigenically distinct. The core is associated with DNA polymerase activity, and antibodies to it can always be detected in HBAg-positive viral hepatitis. The particles which carry HBAg reactivity have surfaces which are antigenically complex. One common specificity, *a*, and 2 pairs of mutually exclusive determinants, *d* and *y* and *w* and *r*, have been recognized and other possible specificities are under investigation. Three different phenotypes of distinct and independent transmissible variations of hepatitis B virus have been identified (*adw*, *adr*, and *ayw*); a fourth, *ayr*, has been found in a few cases, but there is no evidence that it represents a viable transmissible genotype. Epidemiological studies of these subtypes show 3 different geographic patterns. In the U.S. and Northern Europe, Dw (*adw*) predominates among blood donors and Yw (*ayw*), among addicts. In the Eastern Mediterranean and Middle East, Yw is found almost exclusively. In the Far East, DR (*adr*) seems to predominate, although subtypes Dw and Yw are also found. There is some evidence that subtype Y is more infectious than subtype D. Conflicting evidence of clinical differences in hepatitis caused by the different subtypes may be due to host variations and epidemiological factors.

9082 INTRAFAMILIAL SPREAD OF ASYMPTOMATIC HEPATITIS B.

(E.) Szmuness, W.; Prince, A. M. (Lindsley F. Kimball Res. Inst., New York Blood Center, 310 E. 67th St., New York, N. Y. 10021). *Am. J. Med. Sci.* 270(2):293-304, 1975.

A survey of 751 families (more than 3,200 individuals) was conducted to investigate familial aggregation and segregation of hepatitis B (HB) infection. Families with an index-donor antigen positive showed a sex-age standardized prevalence of serologic evidence of HB ten times greater than those who were index-donor antibody positive and two to three times greater than control families with the same ethnic background. There was a high frequency (39-48%) of familial aggregation (2 or more cases). Familial prevalence and aggregation were associated with family size. The prevalence of antigenemia among siblings and parents (11-34%) was higher than among spouses (0-5%). Siblings matched to index-carriers by age demonstrated a higher antigen prevalence (4 to 6-fold higher) than unmatched siblings. Genetic segregation analyses supported the hypothesis for recessive inheritance. In two of three matings with antigen positive partners, all the progeny were antigen positive. It was concluded that both environmental and genetic factors influence the familial aggregation and segregation of HB.

9083 VERTICAL TRANSMISSION OF THE HEPATITIS B SURFACE ANTIGEN. *(E.)* Schweitzer, I. L. (Univ. Southern California Sch. Medicine, Los Angeles, Calif.). *Am. J. Med. Sci.* 270(2):287-291, 1975.

The vertical transmission of hepatitis B virus was studied in 63 pregnant or postpartum women with acute hepatitis B in the United States. Transmission occurred more frequently (70-100%) when the mother had acute hepatitis near delivery. The transmission was found to occur transplacentally or during delivery. Once infected, the infants remain hepatitis B surface antigen (HBsAg) carriers with persistent hepatitis indefinitely. The rate of HBsAg transmission from asymptomatic carrier mothers to their infants is as high as 40% on a worldwide basis. The highest rate is in Taiwan, where neonatal infection correlates with the height of complement fixation of surface antigen in the maternal serum. Of the 36 carrier-mother infant pairs followed in the U. S. for 3 to 42 months, three infants became HBsAg positive as neonates, two became positive between three and six months, and one became positive between six and 12 months of age. Extremely high antibody titers to HBsAg developed in two of the babies within the first year of life. Antigen or antibody positivity did not develop in 33 of the infants.

9084 HEPATITIS B (SURFACE) ANTIGEN IN MOTHERS AND THEIR INFANTS. *(E.)* Kew, M. C.; Marcus, R. G.; Macnab, G. M.; Bersohn, I. (Univ. of the Witwatersrand and Johannesburg Hosp., Johannesburg, South Africa). *S. Afr. Med. J.* 49(36): 1471-1473, 1975.

The possible transmission of hepatitis B virus from mother to infant, either *in utero* or postpartum, was evaluated in eight Caucasian women with hepatitis B surface antigen (HBsAg) in their blood. The blood of 4,525 patients was tested for HBsAg by counter immunoelectrophoresis (CIEP). Seven of the patients (0.16%) were asymptomatic, seropositive carriers of HBsAg, and one patient had polyarteritis nodosa associated with HBsAg antigenemia. Upon delivery, amniotic fluid, colostrum, placental homogenate and cord blood were tested for HBsAg. None of the infants developed clinical hepatitis, and three of the eight were seronegative. Seven were available for follow-up; only one had HBsAg positive serum, but was asymptomatic. Colostrum from four of the mothers was negative for the antigen. Amniotic fluid was positive by radioimmunoassay (RIA) and CIEP in one mother, and by RIA alone in another three. Placenta was also positive by both assays in one, and by RIA alone in another three. HBsAg was detected in cord blood in three cases. It is suggested that a carrier state may occur in the infants of infected mothers; however, the exact mode of transmission is uncertain.

9085 PREVALENCE OF HEPATITIS B ANTIBODY IN PROSTITUTES. *(E.)* Frosner, G. G.; Buchholz, H. M.; Gerth, H. J. (Hygiene-Inst., Univ. Tubingen, 74 Tubingen, W. Germany). *Am. J. Epidemiol.* 102(3):241-250, 1975.

To study the possibility of a venereal transmission of hepatitis B, sera from 258 female and ten male prostitutes, 258 female blood donors (matched controls), and 142 nuns were tested for hepatitis B antibody (anti-HBs) by passive hemagglutination. In addition, the presence of echovirus type 12 and adenovirus type 10 antibodies were determined by hemagglutination inhibition. Both anti HBs and HBsAg occurred more frequently in the prostitutes than in the controls. Of the prostitutes, 31% were anti-HBs-positive (of whom 24% resided in a brothel and 34% lived independently), compared to 10% of the matched blood donors. Three of the male prostitutes, 10% of the nuns living in a convent, and 15% of the nuns working as secondary school teachers were anti-HBs-positive. Hepatitis B antigen (HBsAg) was found in six of the prostitutes, in one nun, and in none of the blood donors. In the blood donors and prostitutes, the prevalence of anti-HBs was correlated with increasing age; the prevalence in the nuns (most of whom were older than 40 yr) was similar to that in the blood donors of the same age. Sixty-two percent of the prostitutes had had gonorrhea at least once, and 15% had had syphilis. Twenty-two percent of the prostitutes who had never had venereal disease were anti-HBs positive, whereas 36% of those who had had venereal disease were antibody positive. When these data were corrected for age, the prevalence of anti-HBs was significantly higher among those who had had more than three recorded venereal infections than among those who had had up to three infections. Similarly, prostitutes registered for more than three yr showed a significantly higher prevalence of anti-HBs than those registered for a shorter time. Antibodies to echovirus type 12 and adenovirus type 10 were also more frequent in prostitutes (27% and 42%, resp.) than in the blood donors (22% and 23%, resp.). There was no significant correlation between the prevalence of these antibodies and the incidence of venereal disease or length of registration. These data support the hypothesized transmission of hepatitis B during sexual contact.

9086 HEPATITIS TYPES B AND NON-B. EPIDEMIOLOGIC BACKGROUND. *(E.)* Mosley, J. W. (Univ. Southern California Sch. Medicine, Los Angeles, Calif. 90007). *JAMA* 233(9):967-969, 1975.

An epidemiologic study was performed using 34 patients, each of whom had been hospitalized for one bout of serologically defined type B acute viral hepatitis and one bout of non-B viral hepatitis. The detailed epidemiologic history obtained in all cases on admission emphasized personal contact, prior transfusion, and illicit self-injection. Of the 34 patients, 24 of whom were men, 20 had the type B episode first and 14 had the non-B episode first; the intervals between the first and second bouts did not differ. Twenty-four of the type B episodes were preceded by illicit self-injection, as were 22 non-B episodes. One non-B episode followed the transfusion of 2 U of blood by 86 days and another non-B episode followed numerous accidental punctures. Acquisition within the hospital through contact with other patients was possible in one patient who consistently denied drug use; in this case, the non-B episode came first. Four additional patients had some form of personal contact with icteric hepatitis 1 to 6 months prior to their onsets; two of these bouts were type B and two were non-B. The remaining 16 bouts, eight each of type B and non-B, were preceded by no occurrence recognizable as a frequent mechanism by which any form of viral hepatitis is acquired. The results indicate that a diagnosis of type B hepatitis should be made only on the basis of serologic tests specific for hepatitis B virus infection. Other cases of sporadic disease in adults must be labeled "viral hepatitis, type unspecifiable."

9087 OCCURRENCE OF VIRAL HEPATITIS TYPE B AND TYPE NON-B IN THREE PATIENTS. *(E.)* Muller, R.; Stephan, B.; Helmstedt, D. (Hannover Medical Sch., Hannover, Germany). *J. Infect. Dis.* 132(2):195-199, 1975.

The occurrence of acute viral hepatitis type B in 3 patients convalescing from hepatitis B surface antigen (HB$_s$Ag)-negative viral hepatitis is reported. Their sera were tested for IgG, IgM, enzyme activity, and HB$_s$Ag; the latter was determined by radioimmunoassay and counterimmunoelectrophoresis. The first patient was a 33-yr-old woman who developed typical signs of acute viral hepatitis 29 days after transfusion of 11 units of whole blood for a uterine hemorrhage. For 3 weeks after hospitalization her serum was negative for HB$_s$Ag and anti-HB$_s$; and she showed rapid clinical improvement. During the fourth week after hospitalization, the patient became positive for HB$_s$Ag and remained positive for 7 weeks when she again developed signs of hepatitis; anti-HB$_s$ appeared during the recovery period. The second patient was a 21-yr-old woman with symptoms suggestive of viral hepatitis followed, 8 days later, by jaundice. Tests for HB$_s$Ag were negative. The patient recovered, but 87 days after onset again developed symptoms of hepatitis; she was then positive for HB$_s$Ag. It is likely that exposure to 2 patients with acute HB$_s$Ag-positive hepatitis during her hospitalization was the source of her second illness. The third patient was a 20-yr-old drug addict who was admitted with signs of acute viral hepatitis. She was negative for HB$_s$Ag and made an uneventful recovery. The patient continued to inject a morphine mixture, and 2 months after onset was found to have HB$_s$Ag-positive viral hepatitis. These cases support the concept of 2 distinctive types of viral hepatitis and provide evidence that patients can acquire viral hepatitis type B and type non-B simultaneously or within a short period. Patients with HB$_s$Ag-positive and HB$_s$Ag-negative hepatitis should be isolated from each other during the acute phase of the illness.

9088 KARYOMETRY OF LIVER BIOPSIES IN VIRUS HEPATITIS. *(E.)* Ranek, L.; Jensen, S. T.; Keiding, N. (Rigshospitalet, 9 Blegdamsvej, DK-2100 Copenhagen Ø, Denmark). *Acta Pathol. Microbiol. Scand.* [*A*] 83(5):477-486, 1975.

In order to quantify the hepatic nuclear variations associated with acute virus hepatitis, liver biopsies were taken from ten patients with clinically mild or moderate cases. The biopsies were taken in the acute phase of the disease, in the recovery phase, or later, and were assessed for nuclear size and the number of binuclear nuclei. The mean nuclear radius of diploid nuclei and the frequency of di-, tetra-, and octaploid nuclei were estimated by a parametric model of nuclear radii distributions. Liver cell nuclei of the acute phase were usually larger with greater size variation than the nuclei of the recovery phase. This pleomorphism could not be attributed to pyknotic and necrotic nuclei only as these types were not measured. It was suggested that increased nuclear metabolic activity was responsible for the nuclear enlargement. The first biopsies demonstrated a greater number of polyploid nuclei and binuclear liver cells, which indicated regenerative activity. No correlation was found between the severity of the disease (as assessed by liver histology and routine liver tests) and the degree of nuclear changes (i.e., size and frequency of polyploid or binuclear liver cells).

9089 PLATELET AND FIBRINOGEN SURVIVAL WITH ^{75}Se SELENOMETHIONINE IN ACUTE INFECTIOUS HEPATITIS. *(E.)* Musumeci, S.; D'Agata, A.; Panebianco, M. G.; Li Volti, S. (Dep. Pediatr., Univ. Catania, Italy). *Thrombos. Diathes. Haemorrh.* 33(3):493-500, 1975.

Simultaneous platelet and fibrinogen survival determinations with ^{75}Se-selenomethionine were performed in 2 normal subjects and in 8 children with acute infectious hepatitis of intermediate severity. Fibrinogen survival alone was estimated in 9 hepatitis patients, 7 of whom were receiving heparin treatment (300 U/kg/day, i.v.). ^{75}Se-selenomethionine (2.5 µCi/kg) was injected i.v. into the subjects, and blood samples were collected 1, 3, and 6 hr later and daily thereafter for platelet and fibrinogen survival determinations. Determinations were also made of the prothrombin time, coagulation time, clot retraction time, platelet factor III availability, plasma fibrinogen, euglobulin lysis time, platelet count, and fibrin monomers. The platelet counts were lowest in a patient who also had measles and in 2 patients with thalassemia major. The retraction time, coagulation, and prothrombin time were slightly prolonged in all patients, fibrinogen levels were within normal limits, and the euglobulin lysis test was negative, as was the test for fibrin monomers. Platelet survival was normal in 7 of 8 patients and was reduced (4.6 days) only in the patient who also had measles. The fibrinogen survival time was markedly reduced in all but one of the hepatitis patients (mean 1.81 ± 0.69 days versus 6-6.5 days in the controls). Fibrinogen survival was also markedly reduced, to a mean of 2.37 days, in the heparin-treated patients. The fibrinogen turnover was 0.58-0.61 mg/ml/day in the controls and 0.59-2.80 mg/ml/day in the hepatitis subjects. In 3 patients, a sudden reappearance of ^{75}Se-selenomethionine in the fibrinogen was observed, probably due to reutilization of the injected ^{75}Se after the first few days. These results are consistent with the hypothesis that in acute infectious hepatitis the decreased survival and turnover of fibrinogen may be due to a pathological pathway of defibrination which is independent of thrombin or plasmin.

9090 EXTRAHEPATIC MANIFESTATIONS OF VIRAL HEPATITIS WHICH ARE INDEPENDENT OF HEPATIC LESIONS. *(Fr.)* Paris, J. (Univ. Hosp. Center, Lille, France). *Cah. Med.* 15(15):1041-1047, 1974.

The effects of viral hepatitis on organs other than the liver are reviewed. It is suggested that viral hepatitis could have entered the liver through the duodenum. Sometimes the extrahepatic biliary ducts are affected during hepatitis; cholecystitis, pediculitis, and choledochitis have been observed. After-effects of hepatitis such as hyposthenic dyspepsia and postprandial diarrhea were noted. Pancreatic involvement paralleling hepatitis causes disturbances in glucose metabolism, diabetes, and amylase modification. In some cases, neuropsychic effects develop early in the disease; in other cases, the neuropsychic effects are late in manifesting themselves. Hepatic insufficiency can lead to both cardio-respiratory and renal problems. Viral hepatitis has a definite effect on the hematopoietic system in the form of leucopenia with thrombocytopenia and late medullary insufficiency. If the patient is pregnant, the disease must be dealt with on both the maternal and fetal levels. Thus, viral hepatitis has numerous extrahepatic effects in man.

9091 ABSOLUTE ERYTHROCYTOSIS IN EARLY INFECTIOUS HEPATITIS. *(E.)* Bank, H.; Passwell, J. (Tel Aviv Univ. Medical Sch., Tel Aviv, Israel). *Med. Chir. Dig.* 3(5):321-323, 1975.

Serial hematocrit estimations and blood and erythrocyte volume studies were performed on 17 young men with clinically typical viral hepatitis to determine whether an apparent rise in erythrocyte, hemoglobin, and hematocrit values was due to an absolute elevation in erythrocyte volume or to dehydration. Blood volume investigations with radioactive chromium (^{51}Cr) were performed by the closed method soon after hospitalization and at least two wk after discharge. The mean blood volume was significantly reduced after discharge (69 ml/kg) compared with the value obtained on admission (75 ml/kg); the patients with the largest blood volumes on admission showed the greatest decrease on repeat examination. The mean proportion of erythrocyte volume in the blood (47%) was also greater on admission than after discharge (42%), while the mean plasma volume estimations were similar at both examinations. In 4 of 7 patients examined, there was a rise in hematocrit following admission, and in two patients the hematocrit showed no such rise; in all seven, the hematocrit fell considerably over the following two wk. The data indicate that dehydration is probably not the cause of the observed rise in erythrocyte volume in these patients.

9092 LYMPHOCYTE RESPONSE TO HEPATITIS B SURFACE ANTIGEN. FINDINGS IN HEPATITIS AND INDIAN CHILDHOOD CIRRHOSIS. *(E.)* Chandra, R. K. (All India Inst. Medical Sci., New Dehli, India). *Arch. Dis. Child.* 50(7):559-561, 1975.

The specific reactivity of lymphocytes to hepatitis B surface antigen (HBsAg) was investigated in Indian children. Lymphocyte delayed hypersensitivy response to phytohemagglutinin (PHA) and HBsAg was evaluated by leukocyte migration inhibtion and DNA synthesis. Four groups of children were studied: ten boys (aged 11-36 months) presented with Indian childhood cirrhosis and with HBsAg present in the serum at some stage of their illness; ten boys (aged 15-36 months) with HBsAg positive hepatitis (four to 24 weeks) studied after clinical recovery; four children with post-necrotic cirrhosis, negative for HBsAg and anti-HBs; and 10 children (controls) with no history of jaundice or blood transfusion, matched for sex and age, and negative for HBsAg and anti-HBs. HBsAg and anti-HBs were detected initially by counterimmunoelectrophoresis and confirmed by radioimmunoassay. Lymphocyte cultures were set up in triplicate. To one set of cultures, PHA was added in doses of 3, 30, and 300 μg/ml and the cells were harvested at 96 and 120 hr. For analysis of results, values of cultures stimulated with 30 μg/ml PHA and examined at 96 hr were used, since these culture conditions yielded maximum counts. To the second set of cultures, purified HBsAg was added in a concentration of 200 μg/ml and the cells were examined at 120 hr. The third set was kept as unstimulated controls. DNA synthesis was measured by [^{3}H]thymidine incorporation using a scintillation counter. The morphology of 200 cells was studied for blast transformation. Lymphocytes of children convalescing from HBsAg-positive hepatitis showed a significant increase in DNA synthesis when cultured in the presence of HBsAg. The increase was confirmed by examination of cell morphology to detect lymphoblasts. Cells of healthy controls negative for HBsAg and anti-HBs, and cells of HBsAg-positive cirrhotic patients showed no increased [^{3}H]-thymidine incorporation on stimulation with antigen. With PHA, the lymphocyte transformation response was comparable in control and hepatitis groups, and slightly, but significantly reduced in cirrhotics. Leukocytes of convalescent patients with hepatitis demonstrated significant inhibition of migration in the presence of HBsAg. The migration of cells obtained from cirrhotics was comparable to that of controls, confirming the lack of hypersensitivity to HBsAg in each of the groups. It is suggested that the lack of immune reactivity to HBsAg, perhaps determined genetically, may be a significant factor in the evolution of cirrhosis in Indian children.

9093 IMMUNOLOGIC MECHANISMS IN HEPATITIS B ASSAYED BY ANTIGEN-BINDING LYMPHOCYTES. *(E.)* Vyas, G. N.; Roberts, I.; Mackay, I. R.; Gust, I. D. (Dept. Clinical Pathology and Laboratory Medicine, Univ. California, San Francisco, Calif. 94143). *Am. J. Med. Sci.* 270(2):241-246, 1975.

The immune mechanisms involved in hepatitis B virus (HBV) infection were studied in individuals with and without hepatitis. Peripheral blood was collected from 16 subjects and tested for HBsAg, anti-HBs, anti-HBc, and ^{125}I-labeled HBsAg binding lymphocytes (ABL). Anti-HBc was detected in all patients positive for HBsAg. High counts of ABL correlated with high titers of anti-HBs in the serum; low counts characterized most cases of chronic hepatitis and the chronic carrier-state for HBsAg. Low counts may represent a tolerance to HBsAg in ABL carriers. The presence of anti-HBc was not related to ABL counts. Thus, the ABL assay for HBsAg and HBcAg may provide a useful tool for understanding the immune mechanism of HBV infection.

9094 IMMUNOLOGICAL STUDIES IN CHILDREN WITH ACUTE VIRAL HEPATITIS.

(E.) Kanakoudi, F.; Nikolaidis, A.; Daniilidis, B.; Manios, S.; Zurukzoglu, S. S.; Cassimos, C. (Paediatric Clinic, Aristotle Univ., Thessaloniki, Greece). *Clin. Exp. Immunol.* 22(1):78-83, 1975.

Smooth muscle autoantibodies (SMA), hepatitis B antigen (HBAg), serum immunoglobulin levels, and delayed cutaneous reactivity to dinitrochlorobenzene (DNCB) were investigated in children with acute viral hepatitis in order to examine the relation between the impairment of delayed-type hypersensitivity and the HBAg carrier state. Of 116 cases (65 boys, 51 girls) of sporadic acute viral hepatitis, HBAg was detected in 21 and SMA in 98 children (the sera was obtained during the first or second week after the onset of jaundice). HBAg was found in 17 of the 18 (94.4%) SMA-negative children and in 4 of the 98 SMA-positive patients. There was no relation between the presence of SMA and sex and age of the patients or the serum bilirubin and transaminase levels. SMA usually did not remain for more than six weeks after the onset of jaundice. Immunoglobulin M (IgM) levels were elevated during the acute phase of the illness and were within normal limits during the recovery phase in 28 out of 41 children. A negative correlation was observed between the presence of SMA, elevated serum IgM levels, and the presence of HBAg in the same patients. The DNCB skin test was positive in all 52 patients without serum HBAg and in 20 out of 21 patients with serum HBAg. Thus, it appeared that there is no gross impairment of the cell-mediated immunity in acute viral hepatitis. It was concluded that hepatitis A is associated with SMA production and an increase in serum IgM levels while hepatitis is associated with HBAg.

9095 IMMUNOPATHOLOGICAL ASPECTS OF HEPATITIS TYPE B.

(E.) Nowoslawski, A.; Krawczynski, K.; Nazarewicz, T.; Slusarczyk, J. (Natl. Inst. Hygiene, Warsaw, Poland). *Am. J. Med. Sci.* 270(2):229-239, 1975.

Tissue samples from 180 unselected necropsy cases of various forms of hepatitis were examined by histopathology and immunofluorescence. The extent of liver damage was correlated with the presence of hepatitis B virus (HBV) antigens and HBV antigen-immune complexes. Hepatitis forms studied included acute fulminant hepatitis (28 patients), subacute hepatitis (48), acute fatal hepatitis (24), chronic aggressive hepatitis (26), liver cirrhosis (49), and "minimal" hepatitis (5). Both hepatitis B surface antigen (HBsAg) and core antigen were detected in 101 patients (56.1%), 77 of whom (76.2%) possessed lesion-bound immune complexes of HBsAg in the liver and extrahepatic locations (i.e., activated germinal centers of lymph nodes and spleen, focal hyaline lesions of splenic and renal arterioles, necrotic and/or proliferative lesions of small and mid-sized arteries, and kidney glomeruli with mild proliferative and degenerative lesions). The amounts of HBsAg in the liver and the liver damage were inversely correlated. Liver damage was directly proportional to the amount of HBsAg immune complexes in the liver and indirectly proportional to their amount in the extrahepatic locations and to the severity of the lesions at these sites. Thus, the immune humoral response to HBV may be an important factor in the pathogenesis of various forms of hepatitis.

9096 IMMUNOHISTOCHEMICAL DEMONSTRATION OF HEPATITIS B CORE AND SURFACE ANTIGENS IN PARAFFIN SECTIONS.

(E.) Huang, S. (Dept. Pathology, McGill Univ., Montreal, Canada). *Lab. Invest.* 33(1):88-95, 1975.

Immunohistochemical methods for the demonstration of the two types of hepatitis B antigen (surface antigen, HBsAg, and core antigen, HBcAg) were investigated in liver tissues fixed in 10% formalin and embedded in paraffin or frozen unfixed. In the unfixed tissues, both direct and indirect immunofluorescent staining methods were performed using anti-HBc and anti-HBs sera. In one case, it was necessary to elute a deposition of autologous antibody (IgG) with 0.1 M glycine-HCl (pH 1.2) before incubation with human anti-HBc serum. Three sets of neutralizing controls were carried out using anti-HBc, anti-HBs, and normal liver tissue homogenates. There was stronger fluorescence in unfixed tissue in all cases. The indirect immunofluorescent method was found to be more sensitive than the direct method. Paraffin sections were found to be superior to unfixed frozen sections because the block could be stored easily and block size could be varied to include the desired examination area. It is concluded that immunohistochemical staining for core antigen provides an additional means for elucidating histopathological changes in Type B viral hepatitis.

9097 IMMUNOPEROXIDASE LOCALISATION OF HEPATITIS B ANTIGEN (HB) IN FORMALIN-PARAFFIN PROCESSED LIVER TISSUE.

(E.) Burns, J. (Radcliffe Infirmary, Oxford, England). *Histochemistry* 44(2):133-135, 1975.

Hepatitis B antigen (HB) was localized in paraffin-embedded liver tissue previously fixed in formalin by the unlabeled antibody-enzyme (PAP) method. The biopsies included chronic hepatitis, chronic biliary obstruction, α,1-antitrypsin deficiency, alcoholic liver disease, hemachromatosis, carcinoma deposits and normal liver. Thin sections were subjected to the following: (a) rabbit anti-HB serum, (b) rabbit anti-HB serum absorbed with a commercial and non-commercial source of HB, and (c) normal rabbit serum in the first immune serum stage of the full PAP method. A characteristic cytoplasmic staining reaction was observed in several hepatocytes in some cases of chronic hepatitis; none of the hepatocytes in any of the other liver biopsies gave a similar reaction. Positive cells demonstrated fine or coarse granular staining in some hepatocytes and homogeneous "ground glass" appearance in others. The staining was either restricted to the sinusoidal pole or honeycomb in appearance. The distribution of positively stained hepatocytes also varied. Relatively smaller numbers were found in chronic aggressive hepatitis and larger numbers, read subjectively, were found in chronic persistent hepatitis. Nonspecific staining was negligible except for some weak staining of necrotic cells that were occasionally positive in hepatitis, alcoholic liver disease, carcinoma deposits, and of bile if sera were not optimally diluted. No positive staining of Kupffer cells or nuclear staining was evident. When the absorbed rabbit anti-HB or normal rabbit serum was substituted for the unabsorbed rabbit anti-HB serum in the first immune stage of the full PAP procedure, the hepatocytes did not stain to any great extent in any of the liver tissues examined. Both the active and inactivated HB gave a positive passive hemagglutination test for HB with the unabsorbed rabbit anti-HB and the horse anti-HB serum. Only those patients whose liver biopsies gave a positive PAP reaction for HB were found to have had a serological history or Australia antigen by both hemagglutination and immunodiffusion tests. The results demonstrate the facility of routine formalin-fixed paraffin-embedded material to retain a demonstrable amount of antigen of immunocytochemical, histological and clinical import.

9098 PRODUCTION OF ANTIBODY TO INDIVIDUAL POLYPEPTIDES DERIVED FROM PURIFIED HEPATITIS B SURFACE ANTIGEN. *(E.)* Dreesman, G. B.; Chairez, R.; Suarez, M.; Hollinger, F. B.; Courtney, R. J.; Melnick, J. L. (Baylor Coll. Medicine, Houston, Tex. 77025). *J. Virol.* 16(3):508-515, 1975.

Several of the major polypeptides derived from purified hepatitis B surface antigen (HBsAg) were purified and the antibody response elicited by them was studied in guinea pigs. Purified preparations of HBsAg were solubilized with sodium dodecyl sulfate and urea under reducing conditions, after which they were fractionated by preparative sodium dodecyl sulfate-urea polyacrylamide gel electrophoresis (PAGE). Pools of the individual fractions eluted from the preparative PAGE were then concentrated and purified further by analytical PAGE. Five purified polypeptides were thereby isolated from HBsAg types *adw* and *ayw;* these polypeptides had molecular weights of 19,000, 24,000, 27,000, 35,000, and 40,000. Each preparation was emulsified in Freund complete adjuvant and injected into the footpads of Hartley strain guinea pigs; the antibody titer to each was measured by radioimmunoassay. The 19,000 molecular weight subunit obtained from both types of HBsAg failed to elicit a measurable antibody response, but the other three polypeptides derived from the *ayw* particles elicited group-specific antibody responses. Similar group-specific reactivities were obtained with anti-*adw*-35,000 and anti-*adw*-40,000 molecular weight polypeptide sera. However, guinea pigs immunized with the 19,000 and 24,000 molecular weight polypeptides of the *adw* type produced antibody that reacted preferentially with *adw* particles. This indicates that either these subunits carry predominantly *d* determinants or that, because of the low levels of material used for inoculation, no immune response or an undetectable one was elicited to the *a* or *w* components. HBsAg subunits which appear to be free of antigenically cross-reactive host cell components and which do not contain infectious viral nucleic acid may yield an effective hepatitis B vaccine.

9099 HBcAg, ANTI-HBc, AND DNA POLYMERASE ACTIVITY IN TRANSFUSED RECIPIENTS FOLLOWED PROSPECTIVELY. *(E.)* Hollinger, F. B.; Dreesman, G. R.; Fields, H.; Melnick, J. L. (Baylor Coll. Medicine, Houston, Tex. 77025). *Am. J. Med. Sci.* 270(2):343-348, 1975.

Post-transfusion hepatitis B patients (345, 16 yr or older) were followed prospectively after blood transfusion. Serum hepatitis B core antigen (HBcAg), antibody to core antigen (anti-HBc), and DNA polymerase activity were measured in order to evaluate the role of hepatitis B virus (HBV) in post-transfusion hepatitis. The study revealed that blood testing with a sensitive radioimmunoassay reduced the incidence of post-transfusion hepatitis B infection by 50%. HBV infection was modified or aborted in the presence of pre-existing antibody to hepatitis B surface antigen (HBsAg). There was no increased risk of post-transfusion hepatitis B when blood containing anti-HBs was transfused. HBcAg and/or DNA polymerase activity, HBsAg, and anti-HBc were detected in the sera of all recipients tested who developed liver enzyme abnormalities. DNA polymerase usually occurred in the early stages of incubation; HBcAg was usually associated with increasing enzymatic evidence of liver damage. This suggests a release of core structures by the hepatocytes. The presence of DNA polymerase without detectable HBcAg may be a result of the presence of intact Dane particles in the sera that mask the core antigen. In the sera of 24 other recipients who developed abnormal transaminase activities, there was no serological evidence of hepatitis B. Evidence of exposure to hepatitis A antigen following transfusion in two of the 24 recipients was demonstrated by immunoelectron microscopy.

9100 TRANSFUSION OF HEPATITIS B IMMUNE COMPLEX-CONTAINING BLOOD IN HIGH HBV PREVALENCE POPULATIONS. *(E.)* Simons, M. J. (WHO Immunology Res. Training Center, Univ. Singapore, Rep. Singapore 3). *Am. J. Med. Sci.* 270(2):349-354, 1975.

The association between post-transfusion hepatitis and hepatitis B surface antigen (HBsAg) was investigated. Data from several countries where there is a high prevalence of hepatitis B virus (HBV) was analyzed. In one study performed in Singapore, HBV immunity was found to provide protection against infection following HBsAg-positive blood transfusions; a greater percentage of the immune recipients failed to develop or developed only transitory antigenemia. Hepatitis developed in 40 of 66 patients (61%) who received HBsAg-positive units; 37 of these 40 (93%) had subclinical cases. Six of the patients who received HBsAg-containing units had HBsAg in the pre-transfusion serum. In four of these six, HBsAg disappeared early in the post-transfusion period (24 hr-4 days) and anti-HBsAg was detected immediately after the disappearance; the anti-HBsAg remained for the duration of the study (24-28 weeks). The HBsAg immune complexemia, detectable by radioelectrocomplexing in approximately 80% of HBsAg-positive blood donors, may be related to the change in HBV immune status. The verification of this HBsAg "cure" would indicate the use of the inactivated viral subunit antigen as a vaccination and as immunotherapy for the HBsAg-positive carrier and patient.

9101 POST-TRANSFUSION HEPATITIS FOLLOWING THE USE OF PROTHROMBIN COMPLEX CONCENTRATES.

(E.) Roberts, H. R.; Blatt, P. M. (Univ. North Carolina Sch. Med., Chapel Hill, N.C.). *Thromb. Diath. Haemorrh.* 33(3):610-616, 1975.

Data are reviewed which suggest an increased incidence of post-transfusion hepatitis in patients receiving infusions of concentrates rich in factor IX and the other prothrombin complex factors. The most likely cause of post-transfusion hepatitis is the hepatitis B virus, which has at least 2 antigens: the hepatitis B surface antigen (HB$_s$Ag); and the hepatitis B "core" antigen (HB$_c$Ag) or Australian antigen. HB$_s$Ag can be detected in about 80% of patients with hepatitis B if looked for at frequent intervals during the period of incubation. Detection of this antigen or antibodies to either of the hepatitis B antigens are important diagnostic criteria for hepatitis B, as are SGPT levels over 4 times the normal levels in the absence of other known causes of elevated SGPT. When radioimmunoassay is employed, the incidence of hepatitis B virus in normal volunteer blood donors is about 4%, and as little as 0.0004 ml of contaminated plasma can be infective. An increased incidence of clinical post-transfusion hepatitis has been associated with the use of factor VIII and factor IX concentrates. In the United States, up to 75% of post-transfusion patients receiving concentrates containing factor IX have developed hepatitis. Although the experience in the U.S. may differ somewhat from that observed in other countries, there appears to be a substantial risk of hepatitis, even with European preparations. It is likely that even those concentrates which are negative for hepatitis B virus when screened by the sensitive radioimmunoassay technique are capable of transmitting hepatitis B. The incidence of hepatitis B in post-transfusion patients can, however, be reduced by using sensitive methods to screen blood donors and the concentrates for hepatitis B antigen and antibody. After transfusion, a careful follow-up for detection of anicteric hepatitis should be performed on all patients; this should include sensitive liver function tests. It is recommended that prothrombin complex concentrates by used only when patients with hemophilia develop life-threatening hemorrhagic episodes and when the risk of hemorrhage outweighs the risk of hepatitis. Attempts should also be made to improve the preparation of factor IX concentrates.

9102 THE EMERGING PATTERN OF POST-TRANSFUSION HEPATITIS.

(E.) Alter, H. J.; Holland, P. V.; Purcell, R. H. (Natl. Institutes of Health, Bethesda, Md. 20014). *Am. J. Med. Sci.* 270(2):329-334, 1975.

A review of sequential studies involving patients undergoing open-heart surgery was undertaken to interpret the clinical and serologic events of post-transfusion hepatitis. The relative value of tests for hepatitis B surface antigen (HBsAg) was also assessed. Patients were followed weekly to biweekly for the first three months after surgery and then monthly for the next three. Those developing alanine amino transferase (SGPT) elevations were followed longer and more frequently. The first phase of the study compared commercial and volunteer donor blood. Fifty-one percent of 82 patients receiving commercial blood developed hepatitis, while none of 28 patients receiving volunteer blood developed the disease. The risk of hepatitis and the icteric risk were 30.6 and 9.5 cases per 1,000 U transfused. Phase II began when counterimmune electrophoresis (CEP) became available as an HBsAg screen. Sixty-nine percent of 16 patients receiving HBsAg positive blood and 25% of 76 patients receiving negative blood developed hepatitis. In phase III, exclusion of all paid donors led to a hepatitis and icteric risk of 3.7 and 1.3 cases per 1,000 units. The residual cases were felt to be either unrelated to B virus or to false negative screen. Phase IV began when radioimmunoassay became available, and consisted of 108 patients transfused with volunteer donor, CEP negative blood. Donor blood was retrospectively tested by RIA in hepatitis cases. Twelve cases of hepatitis were found, four of them icteric, representing a hepatitis and icteric rate of 6.4 and 2.1 cases per 1,000 U. Of the 12 cases, four were type B and eight were non-B. Comparing types B and non-B, they were found to have similar incubation times. Type B was more acutely severe and more frequently icteric than was non-B. The etiology of non-B hepatitis is obscure but was shown to be unrelated to cytomegalo, Epstein-Barr and Type A viruses. It is concluded that despite CEP testing four to six cases per 1,000 units transfused occur and that most type B hepatitis can be prevented by RIA screening. There is also evidence for the existence of a non-A, non-B hepatitis virus.

9103 HEPATITIS B SUBUNIT VACCINE: A PRELIMINARY REPORT OF SAFETY AND EFFICACY TESTS IN CHIMPANZEES.

(E.) Purcell, R. H.; Gerin, J. L. (Natl. Inst. of Allergy and Infectious Diseases, Bethesda, Md.). *Am. J. Med. Sci.* 270(2):395-399, 1975.

The safety and efficacy of hepatitis B surface antigen (HBsAg) vaccine in chimpanzees was evaluated.

Two subunit vaccines were prepared from HBsAg subtypes *ayw* and *adr*. To render each vaccine safer, the infectious Dane particles were removed. The 22 nm noninfective HBsAg of each type was purified by isopycnic banding in cesium chloride followed by rate zonal separation in sucrose and stabilization in human serum albumin. Aliquots of each preparation were inactivated in 1:2,000 formalin at 37 C for 96 hr. Aliquots of active serum and inactivated vaccine were tested for potency in guinea pigs. To determine if B virus infectivity was completely removed from the vaccines, seven chimpanzees were inoculated with one of the following: inactivated or activated *ayw* vaccine; inactivated *adr* vaccine; or saline-albumin solution. Vaccine dosages were 1 ml s.c., containing 20 μg HBsAg, and boosters were given at one month. None of the *ayw*- or *adr*-vaccinated animals developed evidence of hepatitis, while those given *ayw* serum developed the disease. To determine if the vaccines were protective, the same animals were inoculated i.v. with $10^{3.5}$ infectious doses of subtype *ayw* hepatitis B virus at 24 weeks after vaccination. Both of the unvaccinated animals developed hepatitis B, while none of the vaccinated animals did. The animal given the *adr* vaccine developed antibody to the core antigen and an increased titer of HBsAg antibody, but did not develop hepatitis clinically. Immunization with purified HBsAg thus appears to stimulate protection to hepatitis B virus infection.

9104 VIRAL HEPATITIS TYPE B: PROSPECTS FOR ACTIVE IMMUNIZATION. *(E.)* Krugman, S. (New York Univ. Medical Center, New York, N. Y.). *Am. J. Med. Sci.* 270(2):391-393, 1975.

Based on recent findings, the prospects for active, human immunization against type B hepatitis have improved. Studies with heat-inactivated type B virus (strain MS-2) revealed that it retained its antigenicity and was noninfectious. When this serum was used in an active immunizing procedure, it was protective, and was associated with a more attenuated hepatitis B infection and a decreased hepatitis B surface antigen (HBsAg) carrier rate. Studies using liver function and serologic tests to assess immunity of parenterally exposed individuals have shown that 20 of 29 persons receiving the MS-2 heat-inactivated hepatitis B serum were protected; all 20 developed anti-HBs and all were disease-free after two yr. There was evidence of infection in an unimmunized group. The MS-2 serum has been shown to induce antibody to the HBsAg, and not to the core antigen; the former is protective, while the latter is not. The preparation of active subunits of HBsAg suggests that the development of a synthetic HBsAg peptide vaccine is possible. The identification of various subtypes of HBsAg has raised the possibility of cross-immunity. These recent developments indicate that active immunization could be achieved with purified HBsAg or one of its polypeptides or glycolipids.

9105 PURIFIED AND INACTIVATED HUMAN HEPATITIS VACCINE: PROGRESS REPORT. *(E.)* Hilleman, M. R.; Buynak, E. B.; Roehm, R. R.; Tytell, A. A.; Bertland, A. U.; Lampson, G. P. (Merck Institute for Therapeutic Research, West Point, Pa. 19486). *Am. J. Med. Sci.* 270(2):401-404, 1975.

Recent developments concerning a practical hepatitis B vaccine intended for large-scale human use are described. Antigen was separated from pooled plasma by two cycles of isopycnic banding and rate zonal separation. Further purification was performed and resulted in destruction of most of the viral infectivity. Purified antigen in a concentration of 20 μg/ml of protein was treated for 72 hr at 36 C with 1:4000 formalin and was proved to be free of contaminants. Six chimpanzees were inoculated i.v. with 1.0 ml each of the vaccine and six others were infected with live B virus. All of the latter and none of the former developed hepatitis B within six months. Four of six other chimpanzees studied for antibody levels developed acceptable titers after one 20 μg dose and five of the six did so after three repeated doses. It is inferred that the purified hepatitis vaccine is potent, safe and suitable for the first trials in humans.

9106 ATTEMPT TO PREVENT HEPATITIS BY USING SPECIFIC ANTI-HBs IMMUNOGLOBULIN. *(E.)* Couroucé-Pauty, A. M.; Delons, S.; Soulier, J. P. (Centre Nationale de Transfusion Sanguine, 6, rue Alexandre Cabanel, 75015 Paris, France). *Am. J. Med. Sci.* 270(2):375-383, 1975.

An attempt was made to prevent hepatitis by using anti-hepatitis B immunoglobin (HB IG). Patients who had been contaminated by a hepatitis B surface antigen-positive blood transfusion as well as contaminated laboratory and hospital staff members were studied. HB IG was extracted from donor serum containing the surface antigen antibodies. From this, HB IG was prepared and checked for titer. Twenty-nine patients transfused with hepatitis B antigen blood received a single i.m. injection of HB IG (0.16 ml/kg). Of these, two developed clinical hepatitis B, two developed anicteric antigenemia, and 11 developed antibody to the surface antigen. Three patients demonstrated an isolated increase in transaminases. Of four patients receiving a single i.m. injection of 0.5 ml/kg HB IG, none developed hepatitis, but two developed high titer antibodies. Of 80 contaminated staff members receiving 5 ml i.m. of HB IG, eight developed antibodies, two developed hepatitis, and two developed increased transaminases. Ninety-three members of hemodialysis staffs exposed to hepatitis B were given 5 ml of HB IG i.m. every five weeks for the first four months, then every two months for eight months, then quarterly in the second yr. Of 90 staff members completing the treatment, none developed hepatitis or were antigen carriers. Eight developed antibodies. Three of eight unprotected staff members developed hepatitis B. Prior to this study, a hepatitis attack rate of 44% was found in the hemodialysis staff members. It is concluded that favorable protection is encountered in contaminated patients and staff with a single dose of HB IG; staff members working in a highly contaminated environment are protected by repeated doses.

9107 IMMUNOSUPPRESSIVE THERAPY IN PERSISTENT VIRAL HEPATITIS. *(It.)* Arcuri, F.; Paganini, G. (Ospedale Generale Regionale, Genoa, Italy). *Policlinica, Sez. Med.* 80(5):271-284, 1973.

Azathioprine was administered to 23 patients (16 men and 7 women, aged 16-60 yr) with viral hepatitis which persisted for 16 to 74 days after the onset of symptoms. An initial dose of 50 to 100 mg/day was administered and, in some cases, this was increased to 200 mg/day. Azathioprine therapy was continued for 14 to 74 days. The initial serum transaminase values in these patients were not excessively high, but in most cases they had been elevated for more than one month. Shortly after initiation of therapy, SGOT and SGPT activities fell suddenly, reaching normal values within a few months in all cases. Such a sudden halt in hepatic cytolysis cannot be attributed to azathioprine reaching therapeutic values in the liver and tissues, but rather to the immunosuppressive action of the drug. Azathioprine was tolerated well by all but five of the patients who developed temporary leukopenia. Leukopenia was reversible after discontinuation of the drug.

9108 LIVER FUNCTION AFTER RENAL TRANSPLANTATION. *(E.)* Zazgornik, J.; Schmidt, P.; Kopsa, H.; Deutsch, E. (I. Medizinischen Universitatsklinik Wien, Vienna, Austria). *Med. Chir. Dig.* 4(2):81-84, 1975.

Liver function was studied in 15 patients after renal transplantation to determine whether hepatitis-B antigen (HBAg)-serum-hepatitis is a major cause of deterioration in liver function during regular dialysis treatment (RDT). In all patients, immunosuppressive therapy with prednisolone (100 mg/day up to 6 months, 25 mg/day after 6 months and 21 mg/day after 12 months), azathioprine (2-3 mg/day), and anti-lymphocyte-globulin (30 ml/day for 20 days) was begun immediately following surgery. Liver enzymes, HBAg, and HBAb (hepatitis-B antibody) were measured every month throughout RDT and after renal transplantation. Nine of the patients had HBAg-serum hepatitis during dialysis treatment: three were HBAg positive; one was HBAb positive; and five were HBAg negative at the time of transplantation. HB-antigenemia persisted for 7 to 19 months after renal transplantation in the HBAg positive patients; all had chronic hepatitis. Of the five HBAg negative patients, one developed HB-antigenemia three months after surgery and one became HBAb positive two months after surgery; both patients exhibited pathological liver function during serological recurrence of hepatitis. The other three patients remained HBAg negative although biochemical findings revealed hepatitis some weeks after surgery. Of the six patients with no history of hepatitis during dialysis, two became HBAg positive one to two months after surgery. The other four patients remianed HBAg and HBAb negative, although one showed clinical evidence of hepatitis 12 months after surgery. In all but one patient, bilirubinemia of 2.7 mg/100 ml and serum hepatitis were present. The data indicate that serum hepatitis could be a serious complication and the cause of persistent liver disease during RDT and after renal transplantation. There was no evidence that azathioprine was a causative factor in the development of liver disease in these patients.

9109 EXCHANGE TRANSFUSIONS IN THE TREATMENT OF ACUTE LIVER FAILURE. *(It.)* Naccarato, R.; Gritti, G.; Giunta, F.; Chiaramonte, M.; Valenti, F. (Inst. Medical Pathology, Univ. Padua, Italy). *Minerva Chir.* 29(18):982-988, 1974.

A modification of Abouna's method was used to perform isovolemic exchange transfusions on 16 patients in hepatic coma (stage 2-3). These patients consisted of: (1) seven patients (aged 10 to 63 yr) with viral hepatitis; (2) three infants (aged 4-14 mo) with viral hepatitis; and (3) six children (aged 5-12 yr) all but one of whom had *Amanita phalloides* intoxication. Respiratory failure was present in ten cases, alkalosis in 11, acidosis in four, gastrointestinal bleeding in six, and hypoglycemia in three. Abnormalities in the acid-base balance were treated by adding 5 to 8 mEq of sodium bicarbonate to each unit of blood. The volume of blood exchanged averaged 100 mg/kg; the flow rate was between 50 and 60 ml/min; and the time blood was stored ranged from 24 to 72 hr. Exchange transfusions were performed at 18 to 24 hr intervals as needed. From two to six transfusions were performed on 11 of these 16 patients. Immediately after each exchange transfusion, serum bilirubin concentrations fell to half their initial values and the prothrombin activity increased significantly. This was followed by a marked decrease; however, values which usually result in severe bleeding were not reached. Recoveries occurred in six of the seven patients in group (1); in one of the three patients in group (2), and in only one of the six patients in group (3). Only the oldest of the three infants in group (2) survived. All five patients in group (3) who failed to respond to exchange transfusions died 7 to 8 days after ingestion of the mushrooms without showing any signs of improvement. It is concluded that exchange transfusions are not effective in the treatment of hepatic coma caused by *Amanita phalloides* intoxication.

9110 ORAL CONTRACEPTIVES IN ACUTE VIRAL HEPATITIS. *(E.)* Schweitzer, I. L.; Weiner, J. M.; McPeak, C. M.; Thursby, M. W. (Univ. Southern California Sch. Medicine, Los Angeles, Calif.). *JAMA* 233(9):979-981, 1975.

The effects of oral contraceptives on the course of acute viral hepatitis and/or its sequelae were studied in 34 women who took these drugs during the major part of the acute and convalescent phases of viral hepatitis. Control patients had the disease at the same time and were treated at the same facility but had never taken oral contraceptives. The two groups were similar in terms of age, duration of illness preceding hospitalization, length of hospitalization, presence or absence of hepatitis B surface antigen, and maximum laboratory abnormalities. After discharge, the patients were followed up at intervals of 2 wk, 2 months, 5 months, and one yr; they were classified as healed, probably healed, healed with probable carrier state, showing probable persistent hepatitis, showing persistent hepatitis, or showing recurrence. The outcome and sequelae of the acute viral hepatitis did not differ significantly between the oral contraceptive users and controls. The data suggest an absence of any deleterious effects of oral contraceptive agents administered during acute viral hepatitis.

9111 EMPIDEMIOLOGICAL OBSERVATIONS ON THE FAMILIES OF HEPATITIS B ANTIGEN CARRIERS AND HEPATITIS B ANTIBODY-POSITIVE INDIVIDUALS [abstract]. *(E.)* Hellawell, J. M.; Woolf, I. L.; Jones, D. M.; Dymock, I. W. (Univ. Hosp. South Manchester, Manchester, England). *Gut* 16(5):402, 1975.

9112 SERUM IgG LEVELS IN SUBACUTE HEPATIC NECROSIS [abstract]. *(E.)* Dourdourekas, D.; Canlas, N.; Ainis H.; Szanto, P.; Steigmann, F. (Hektoen Institute for Med. Res., Chicago, Ill.). *Gastroenterology* 68(4):1086, 1975.

9113 ALPHA - ANTITRYPSIN AND FULMINANT HEPATITIS [abstract]. *(E.)* Rueff, B.; Morin, T.; Martin, J. P.; Feldmann, G.; Ropartz, C.; Benhamou, J. P. (Hosp. Beaujon, Clichy, France). *Gastroenterology* 68(4):1084, 1975.

9114 NON-A, NON-B HEPATITIS: SEROLOGIC STUDIES OF TWO PATIENTS WITH MULTIPLE EPISODES [abstract]. *(E.)* Mosley, J. W.; Redeker, A. G.; Karvountzis, G. G. (Univ. Southern California, Los Angeles, Calif.). *Gastroenterology* 68(4):1082, 1975.

9115 THE e ANTIGEN AS AN INDEX OF CHRONIC HEPATITIS B VIRUS INFECTION [abstract]. *(E.)* Fay, O.; Edwards, V. M.; Mosley, J. W.; Redeker, A. G. (Univ. Southern California Sch. Med., Los Angeles, Calif.). *Gastroenterology* 68(4):1081, 1975.

9116 FAILURE TO DETECT HEPATITIS B SURFACE ANTIGEN (HB$_{S}$AG) IN CERTIFIED SHELLFISH IN NEW ENGLAND [abstract]. *(E.)* Koff, R. S.; Connelly, L. J. D. (VA Hosp., Boston, Mass). *Gastroenterology* 68(4):1079, 1975.

9117 HEPATITIS B CORE AND SURFACE ANTIGENS, IMMUNOGLOBULINS, AND COMPLEMENT LIVER BIOPSIES: DETECTION BY DIRECT IMMUNOFLUORESCENCE [abstract]. *(E.)* Trepo, C.; Schaefer, R. A.; Vitvitski, L.; Prince, A. M. (Dept. Med., Cornell Univ., New York, N.Y.). *Clin. Res.* 23(3):258A, 1975.

9118 INHIBITION OF MACROPHAGE MIGRATION IN RESPONSE TO HEPATITIS B$_{S}$ ANTIGEN (HB$_{S}$AG) [abstract]. *(E.)* Howlett, S. A.; McGuigan, J. E. (Univ. Florida Coll. Med., Gainesville, Fla.). *Gastroenterology* 68(4):951, 1975.

9119 PRELIMINARY REPORT ON HBAg SUBTYPES IN WESTERN SICILY [abstract]. *(E.)* Dardanoni, L.; Filippazzo, G.; La Licata, S.; Pagliaro, L.; Spano, C. (Divisione de Medicina dell'Ospedale, Palermo, Italy). *Rend. Gastroenterol.* 6(3):208-209, 1974.

9120 THE ROLE OF AUTOANTIBODIES IN THE PATHOGENESIS OF VIRAL HEPATITIS IN CHILDREN. *(Rus.)* Nisevish, N. I.; Uchaikin, V. F.; Cheredinchenko, T. V.; Seitnepesov, K. (Dept. Infectious Diseases of Childhood, N. I. Pirogov Second Moscow Medical Inst., Moscow, USSR). *Vopr. Okhr. Materin. Det.* 20(3):3-7, 1975.

9121 TREATMENT OF PATIENTS WITH VIRAL HEPATITIS SUFFERING FROM PULMONARY TUBERCULOSIS. *(Rus.)* Djakdish, P. (Dept. Infectious Diseases, Lvov Medical Inst., Lvov, USSR). *Vrach. Delo* (4):123-126, 1975.

9122 STUDIES ON THE SO-CALLED "STOMATOCYTES" IN THE PERIPHERAL BLOOD OF PATIENTS WITH VIRAL HEPATITIS. *(Pol.)* Boron, P.; Ostaszewska, A.; Borowska, E.; Klonowska, A. (Clinic Infectious Diseases, Medical Acad., Bialystok, Poland). *Pol. Tyg. Lek.* 30(16):665-668, 1975.

9123 CLINICO-LABORATORY CHARACTERISTICS OF THE RESTORATIVE PERIOD OF VIRAL HEPATITIS IN WORKERS OF CHEMICAL ENTERPRISES. *(Rus.)* Mukhordov, F. G.; Krasnov, A. V.; Dokukina, A. G. (Dept. of Infectious Diseases, Kemerovo Medical Inst., USSR). *Ter. Arkh.* 47(2):92-95, 1975.

9124 THERAPY OF PATIENTS WITH SERUM HEPATITIS. *(Rus.)* Ilyinsky, R. A.; Pak, S. G.; Brodov, L. E.; Lychskev, V. I. (Clinical Div., Central Inst. Epidemiology Ministry Public Health USSR, Moscow, USSR). *Vrach. Delo* (4):120-123, 1975.

9125 DETERMINATION OF CERTAIN BLOOD CLOTTING AND FIBRINOLYSIS FACTORS IN PATIENTS WITH VIRUS HEPATITIS. *(Pol.)* Przyemski, J.; Chrostowska, H.; Ellert-Zygadiowska, J.; Krzysztofowicz, J. (Clinic Infectious Diseases, Medical Acad., Gdansk, Poland). *Wiad. Lek.* 28(7):533-542, 1975.

9126 DIAGNOSIS OF THE CHOLANGIOLYTIC FORM OF VIRAL HEPATITIS. *(Rus.)* Bychkova, V. I. (Dept. Infectious Diseases, Dnepropetrovsk Medical Inst., USSR). *Klin. Med. (Mosk.)* 53(2):37-42, 1975.

9127 CLINICO-BIOCHEMICAL AND MORPHOLOGICAL COMPARISONS IN PERSONS WITH LONG-TERM SH-ANTIGENEMIA FOLLOWING VIRAL HEPATITIS. *(Rus.)* Sinaiko, G. A.; Paktoris, E. A.; Braginsky, D. N.; Sergeeva, N. A.; Shumkina, O. B.; Kulchak, S. N. (Clinical Div., D. I. Ivanovskiy Inst. Virology, Moscow, USSR). *Klin. Med. (Mosk.)* 53(1):73-80, 1975.

See also, 8468, 8474, 8913, 8961, 8981, 9141, 9204, 9208, 9278.

LIVER AND BILIARY TRACT

Chronic Hepatitis

9128 PERIARTERITIS NODOSA, LIVER DISEASE, AND PERSISTENT HEPATITIS B ANTIGEN. *(Ger.)* Strohmeyer, G.; Berger, M.; Jacobi, E.; Borchard, F. (II. Medizinische Klinik, Universitat Dusseldorf, Germany). *Z. Gastroenterol.* 13(4):452-456, 1975.

A 68-yr-old man who had a history of recurrent tonsillitis as a child and who was suspected of having polyarthritis and myocarditis was hospitalized with weight loss, dermographia, cyanosis, hepatomegaly, paresis, and abnormal reflexes in the lower extremities. Radiological findings included pulmonary emphysema and a horizontal gallbladder which was located far to the side; no evidence of cholelithiasis was found. Serum transaminase and alkaline phosphatase values were initially within normal limits, but serum hepatitis B antigen titers (determined by radioimmunoassay) were five times higher than normal. Histological examination of a liver biopsy showed chronic persistent hepatitis with moderate steatosis and interlobular fibrosis. A diagnosis of periarteritis was confirmed by a skeletal muscle biopsy. The patient developed refractory diastolic hypertension and high fevers which failed to respond to antibiotics. Prednisone (60 mg/day, in decreasing doses) was administered, but the patient continued to lose weight, developed polyneuritis, and died of chronic circulatory failure. At autopsy, signs of periarteritis were found in the liver, heart, kidneys, and pancreas. Histological examination of the liver revealed moderate- to large-sized fat vacuoles in many liver cells in the center of the lobules. The nuclei of these cells differed in size and many contained two nuclei and large clumps of lipofuscin pigment in their cytoplasm. Glisson's fields were enlarged, moderately scarred, and generally contained thick inflammatory infiltrates. A larger branch of the hepatic artery was obstructed and a smaller one was stenotic with parenchyma which had split off the tunica media. A few liver cells, but not the walls of the blood vessels, stained weakly positive with aldehyde-thione which is said to be a technique for staining hepatitis B antigen. These findings are similar to those from other cases reported in the literature.

9129 GENETIC ANALYSIS OF PATIENTS WITH CHRONIC ACTIVE HEPATITIS. *(E.)* Page, A. R.; Sharp, H. L.; Greenberg, L. J.; Yunis, E. J. (Univ. Minnesota Medical Sch., Minneapolis, Minn. 55455). *J. Clin. Invest.* 56(3):530-535, 1975.

HL-A genotyping was performed in 17 female and four male chronic active hepatitis patients, and the frequency of the HL-A8-associated mixed lymphocyte culture (MLC) determinant 8a was determined among patients and controls matched for HL-A types. Most of the patients responded favorably to prednisone and/or 6-mercaptopurine therapy. HL-A antigens were determined using a standard two-stage dye exclusion microcytotoxicity test, and unidirectional mixed culture reactivity was determined by a microculture technique. Both HL-A1 and HL-A8 were significantly increased in the patient group compared with the controls; the increased frequency of the former was secondary to the increased HL-A8 due to linkage disequilibrium. Genotype analysis also revealed a striking increase in HL-A8 homozygosity in the patients (28.5%) as compared with the controls (2.8%). Two of the patients and one control, who were homozygous for both HL-A8 and HL-A1, were homozygous for MLC determinant 8a. This determinant was carried by 5 of 7 HL-A8 homozygous controls, 2 of 5 HL-A8 homozygous patients, 8 of 15 HL-A8 heterozygous controls, 3 of 5 HL-A8 heterozygous patients, none of 27 HL-A8-negative controls, and 1 of 7 HL-A8-negative patients. The proportion of patients and controls carrying 8a was the same when the two groups were matched for HL-A typing. The data suggest that susceptibility to chronic active hepatitis is determined by homozygosity for a gene that is in linkage disequilibrium with HL-A8 and more closely associated with the HL-A second locus than with the locus for the major MLC determinant.

9130 IMMUNOLOGICAL AND BIOHUMORAL FEATURES OF CHRONIC AGGRESSIVE HEPATITIS: CHANGES RELATED TO THE PRESENCE OF HEPATITIS B ANTIGEN (HBAg). *(It.)* Ascione, A.; Claar, G. M.; Oriani, G. A. (Ospedali Riuniti Napoli, Italy). *Gazz. Sanit.* 45(6/7):154-157, 1974.

Direct bilirubin, SGOT, SGPT, γ-glutamyl transaminase (γ-GT), pseudocholinesterase (PCH), and immunoglobulin fractions were determined on serum samples from 27 patients with chronic aggressive hepatitis confirmed by hepatic biopsy according to the criteria proposed by De Groote *et al.* HBAg was determined by electrosyneresis. Of these 27 patients, 13

(48.1%) were HBAg-positive (median age 28 yr) and 14 were HBAg-negative (median age 30 yr). No significant differences between these two groups were found for mean direct bilirubin, SGOT, SGPT, γ-GT, or PCH values. While mean immunoglobulin levels were higher in HBAg-negative patients, only the mean IgM concentration was significantly higher than in HBAg-positive patients. Studies of correlations between the various parameters showed a significant inverse correlation between SGOT activities and IgA concentrations in HBAg-negative but not in HBAg-positive patients. This correlation confirms the clinical impression that HBAg-negative patients with chronic aggressive hepatitis more often develop cirrhosis. A direct correlation was found between SGPT and PCH values in HBAg-positive but not in HBAg-negative patients. Although no definite conclusions can be drawn from this correlation, it is hypothesized that this type of relation indicates a tendency for SGPT to decrease as protein synthesis decreases. It is concluded that HBAg-positive and HBAg-negative patients with chronic aggressive hepatitis suffer from the same disease although the prognosis may differ due to differences in immune response which are related to genetic and geographical factors.

9131 RESULTS OF IMMUNOSUPPRESSIVE TREATMENT: PROGNOSIS IN CHRONIC ACTIVE HEPATITIS. *(E.)*

Pelikan, V.; Seidlova, V.; Sanova, J.; Komenda, S. (No affiliation given). *Acta Hepato-Gastroenterol.* 22(4):210-214, 1975.

The efficacy of immunosuppressive therapy in chronic active hepatitis was studied in 21 patients followed for 7 yr. In most cases, previous corticosteroid therapy had been discontinued because of side-effects or lack of response. Immunosuppressive therapy consisted of a combination of prednisone (10-15 mg) or triamcinolone (4-8 mg) with 6-mercatopurin (75-100 mg). Of these 21 patients, 4 already had cirrhosis; none were known alcoholics or chronic users of hepatotoxic drugs. Within 6 yr after institution of immunosuppressive therapy, 4 patients had died, 3 of them of liver disease and 1 of lung cancer. In 3 patients, the treatment was discontinued after 1 yr or longer with no subsequent exacerbations, but in 13 patients treatment had to be continued even if the subjective condition and biochemical findings indicated that the disease was stabilized. Among the latter 13 patients, 2 developed cirrhosis and 3 developed portal hypertension with varices and collateral circulation during treatment. Immunosuppressive therapy was associated with decreased transaminase (from 12.15 to 2.68 mM) and γ-globulin (from 2.57 to 1.85 g/100 ml) values and with decreased infiltration of the portal and periportal areas. However, fibrotic changes were more pronounced after therapy than before. The WBC and platelet count remained above the lower normal limit, circulating antibodies against liver cells and bile duct cells were found in 80% of the patients, and 8 patients remained positive for hepatitis B antigen throughout treatment. Immunosuppressive drugs did not have to be discontinued because of side effects in these 13 patients. Mathematical estimates suggest that the probably survival of the 21 patients in this series will be 5.5 to 6.5 yr. The data tend to support the view that immunosuppressive therapy has a beneficial effect on the clinical activity and prognosis of chronic active hepatitis.

9132 PROTHROMBIN COMPLEX CONCENTRATE: USE IN CONTROLLING THE HEMORRHAGIC DIATHESIS OF CHRONIC LIVER DISEASE. *(E.)*

Bick, R. L.; Schmalhorst, W. R.; Shanbrom, E. (Sch. Medicine, Univ. California, Los Angeles, Calif.). *Am. J. Dig. Dis.* 20(8):741-749, 1975.

Clinical course and coagulation changes were studied in four patients (two men and two women, aged 22-61 yr) with chronic liver disease. A prothrombin complex concentrate was infused in an attempt to control life-threatening gastrointestinal bleeding and systemic bleeding. In all patients, the initial prothrombin time and quantitative factor II levels were between 10% and 30%, and all had failed to cease bleeding with conventional supportive measures. The amount of prothrombin complex concentrate infused was that calculated to be necessary to raise the factor II level to about 100% of normal. The Quick prothrombin time became normal after one hr of infusion and remained normal only during infusion, a total of three hr; prothrombin time returned to initial levels after two days. Factor II activity approached normal levels about two hr after beginning the infusion and three patients showed an unexplained spontaneous increase in factor II activity 48 hr after cessation of the infusion. Factor IX activity also increased steadily during the infusion but then fell steadily after it was discontinued. Factors VII and X rose steadily during the infusion but fell more sharply afterward. Factors V and VIII increased moderately during the infusion, the former falling immediately after stopping the infusion and the latter falling more slowly. Factors VIII and IX showed spontaneous increases in three patients 48 hr after the cessation of infusion. The half lives of factors II, IX, VII, X, and VIII were 18 hr, 14 hr, 7 hr, 7 hr, and 5 hr, resp. The data indicate that the use of a prothrombin complex concentrate may be a relatively safe and potentially efficacious modality for controlling life-threatening hemorrhage associated with decreased prothrombin complex factors in chronic liver disease. The use of such a complex should be limited to those patients who have a demonstrable decrease in factors II, VII, IX, and/or X and who are to undergo corrective surgery for bleeding once hemostasis is achieved. It should be used in conjunction with other modalities needed to correct all demonstrable hemostatic defects.

9133 PROGNOSTIC EXPERIENCE IN LONG-TERM DIFFERENTIAL THERAPY OF CHRONIC AGGRESSIVE HEPATITIS. *(Ger.)*

Sensing, H.; Vollmar, F. (Medizinische Akademie, DDR-50 Erfurt, Nordhauser Strasse 74, Germany). *Dtsch. Z. Verdau. Stoffwechselkr.* 34(5/6):293-298, 1974.

A diagnosis of chronic aggressive hepatitis with no evidence of cirrhosis was established by biopsy and/or laparoscopy in 44 patients (19 females and

25 males, aged 12-64 yr; mean age 41.4 yr). Prednisolone (10 mg/day) was administered to 19 of these patients (14 women and 5 men, aged 12-63 yr; mean age 37.8 yr) for 2 yr, and 6-mercaptopurine (6-MP) (50 mg/day) was used to treat the remaining patients (5 women and 20 men, aged 21-64; mean age 44.1 yr). Liver function tests (serum color value, thymol turbidity test, serum electrophoresis, SGOT, SGPT, iron alkaline phosphatase, and BSP) were performed before and after treatment, and biopsies and/or laparoscopies were repeated on all patients; six other patients given prednisolone refused biopsy and could not be included in the results. Liver function tests showed no appreciable differences between results obtained with prednisolone and those obtained with 6-MP, but histological improvement occurred in 84.2% of those in the prednisolone group and in only 56.0% of those given 6-MP. Histological findings normalized completely in one patient given prednisolone. After treatment, chronic persistent hepatitis was diagnosed histologically in 21.1% of prednisolone-treated patients and in 16.0% of those given 6-MP, while chronic aggressive hepatitis persisted in five (26.3%) of the prednisolone group and in 13 (52%) of those given 6-MP. Degenerative parenchymal damage was more common in the prednisolone group (42.1%) than in patients treated with 6-MP (20.0%), and histological findings became worse in 5.3% of the prednisolone group and 12.0% of patients receiving 6-MP. Manifest symptoms of portal hypertension occurred only in patients given 6-MP who developed cirrhosis. Statistical analysis with the X^2 test showed that histological differences between these two groups of patients were not significant.

9134 IMMUNOLOGICALLY COMPETENT CELLS IN HBAg POSITIVE AND NEGATIVE CHRONIC ACTIVE HEPATITIS [abstract]. *(E.)* Kawanishi, H.; Brown, G. C.; O'Leary, T. O. (VA Hosp., Ann Arbor, Mich.). *Gastroenterology* 68(4):923, 1975.

9135 CHRONIC ACTIVE LIVER DISEASE (CALD) IN ASSOCIATION WITH CHRONIC ALCOHOLISM (CA) [abstract]. *(E.)* Goldberg, S.; Mendenhall, C. L.; Connell, A. (Univ. Cincinnati Coll. of Medicine, Cincinnati, Ohio). *Gastroenterology* 68(4):1080, 1975.

9136 CHRONIC ACTIVE HEPATITIS AND ETHANOL—A FORM OF DRUG HEPATITIS [abstract]. *(E.)* Galambos, J. T. (Emory Univ. Sch. Med., Atlanta, Ga.). *Gastroenterology* 68(4):1075, 1975.

9137 CYTOTOXICITY OF AUTOLOGOUS AND NORMAL LYMPHOCYTES AGAINST ISOLATED LIVER CELLS FROM PATIENTS WITH CHRONIC ACTIVE LIVER DISEASE (CALD) [abstract]. *(E.)* Geubel, A. P.; Keller, R. H.; Summerskill, W. H. J.; Stobok, J. D.; Tomasi, T. B.; Shorter, R. G. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 68(4):1084, 1975.

9138 THE VALUE OF BIOCHEMICAL STUDIES IN THE DIAGNOSIS OF CHRONIC ACTIVE HEPATITIS (CAH) OF VARIOUS ETIOLOGIES [abstract]. *(E.)* Nowak, T. V.; Parker, H. W.; Varma, R. R. (Med. Coll. of Wisconsin, Milwaukee, Wis.). *Gastroenterology* 68(4):1087, 1975.

See also, 8971, 9026, 9118, 9184, 9199, 9206, 9210, 9211.

LIVER AND BILIARY TRACT

Alcoholic Liver Disease

9139 CASUAL BLOOD-ETHANOL ESTIMATIONS IN PATIENTS WITH CHRONIC LIVER DISEASE. *(E.)* Hamlyn, A. N.; Sherlock, S.; Brown, A. J.; Baron, D. N. (Royal Victoria Infirmary, Newcastle upon Tyne, England). *Lancet* 2(7930):345-347, 1975.

Blood-ethanol levels in 172 outpatients with alcoholic, cryptogenic, and other liver diseases were assessed and evaluated. An unselected sample of outpatients was questioned as to drinking habits. The blood-alcohol content of specimens drawn from a peripheral vein was estimated by gas chromatography, followed by liver biopsy when necessary. Of the 172 patients tested, 36% admitted drinking more than 80 g of ethanol/day; 13% had ethanol detectable in their blood. While ethanol was not detected in any of the 95 patients with non-alcoholic or non-cryptogenic cirrhotic liver disease, 41% of those with alcoholic liver disease had ethanol in the blood. The most constant detection of blood-ethanol occurred in those with alcoholic hepatitis or alcoholic steatosis; 65% of those had blood-ethanol. Forty-five percent of all patients admitting to heavy drinking had ethanol in the blood at one time or another, although it was found that the patients generally underestimated their intake. Likewise, no patient with a positive blood-ethanol level had a normal liver biopsy. When detected, the distribution of blood-ethanol levels corresponded to a log-normal curve with a mode at 28 ml/dl and noted a significant excess of women with higher blood-alcohol levels. While a history of heavy drinking was more constantly associated with alcoholic liver disease than was the finding of blood-ethanol, the blood test was considered a useful confirmation of clinical suspicion. The results indicated that a history of heavy drinking and positive blood-ethanol were not greatly associated with cryptogenic liver disease, but rather with alcoholic liver damage. It is also suggested that serial blood-ethanol estimations are valuable in the treatment of alcoholics and the detection of relapses.

9140 FATTY ACID PATTERN IN HUMAN FAT AND LIVER TISSUE IN NONALCOHOLICS AND ALCOHOLICS.

(Ger.) Berghaus, G.; Kurz, A.; Dotzauer, G. (Institut Gerichtliche Medizin, Universitat Koln, 5 Koln 30, Melatengurtel 60-62, Germany). *Dtsch. Med. Wochenschr.* 100(22):1233-1238, 1975.

After hydrolysis with sodium methylate, free fatty acids were determined quantitatively by gas-liquid chromatography in samples of subcutaneous fat and liver from 116 subjects (78 males and 38 females) who were autopsied after dying suddenly. Of these 116 subjects, 56 died of natural causes, 26 committed suicide, five were murdered, and 21 died in accidents. Since little information on the alcohol comsumption of these subjects was available, only 19 subjects known to the police as drinkers and/or those who had undergone one or more courses of withdrawal were classified as alcoholics. Comparisons were also made between the extent of fatty infiltration in livers from alcoholics and nonalcoholics. Calculation of Spearmann's correlation coefficients to analyze the relation between the extent of fatty infiltration and the fatty acid pattern showed that as the extent of fatty infiltration increased, so did the relative amount of palmitoleic acid in the liver and subcutaneous fat with decreases occurring in the relative proportion of stearic acid in subcutaneous fat. The mean content of total esterified fatty acids was 13.44% in the livers of alcoholics and only 5.62% in those of nonalcoholics; this difference is significant. A comparison of the fatty acid patterns of alcoholics and nonalcoholics demonstrated that the relative proportion of palmitoleic acid was significantly higher in the subcutaneous fat of alcoholics than in that of nonalcoholics. In alcoholics, the proportion of palmitoleic acid was higher in the liver than in subcutaneous fat, while in nonalcoholics the reverse was true. Studies are now in progress to study the relation of the fatty acid pattern of serum triglycerides, free fatty acids, and blood alcohol levels.

9141 REDUCED PERIPHERAL CONVERSION OF THYROXINE TO TRIIODOTHYRONINE IN PATIENTS WITH HEPATIC CIRRHOSIS.

(E.) Nomura, S.; Pittman, C. S.; Chambers, J. B.; Buck, M. W.; Shimizu, T. (Veterans Admin. Hosp., Birmingham, Ala. 35233). *J. Clin. Invest.* 56(3):643-652, 1975.

The role of the liver in the peripheral conversion of thyroxine (T_4) to triiodothyronine (T_3) was studied in normal subjects and patients with alcoholic liver disease by measuring thyrotrophin (TSH) and total and free T_4 and T_3 in random and serial serum samples. Also, T_4 to T_3 conversion rates and T_3 disposal rates were compared by noncompartmental analysis. While the mean total serum T_4 values were similar for the two groups of subjects, the mean free T_4 value was significantly higher in the cirrhotic patients (3.3 ng/dl) than in the normal subjects (2.1 ng/dl). The mean serum T_3 value was significantly reduced in the cirrhotic patients (85 ng/dl) as compared with the normal subjects (126 ng/dl), although the free T_3 value was 0.28 ng/dl in both groups. The reduction in the serum total and free T_3 values was closely correlated with the degree of liver damage, as indicated by elevations in serum bilirubin and reductions in serum albumin. The mean serum TSH level was 3.1 μU/ml in the normal subjects and 7.1 μU/ml in the cirrhotic patients. Fifteen percent of the cirrhotic patients had serum TSH values greater than 10 μU/ml, but these values did not correlate with any of four liver function tests. Serial blood samples from two convalescing patients with alcoholic hepatitis showed a gradual normalization of the serum TSH and T_3 levels as the liver function improved. However, the serum T_3 values in 3 of 4 cirrhotic subjects showed no rise following p.o. T_4 administration (0.25 mg/day for 10 days). The mean T_4 to T_3 conconversion rate in seven normal subjects was 35.7%, the mean conversion rate in the four cirrhotic subjects being significantly reduced to 15.6%. The mean disposal rates of T_4 and T_3 in the normal subjects were 114 and 34 μg/day, resp., and the ratio of T_4 disposal to T_3 disposal was 3.5. In contrast, the mean T_4 and T_3 disposal rates (82 μg/day, and 10 μg/day, resp.) in the cirrhotic subjects were reduced and the ratio of T_4 disposal to T_3 disposal in these subjects was 7.9. The data suggest that impairment of T_4 conversion in patients with advanced hepatic cirrhosis may lead to reduced T_3 production and lowered serum T_3 concentrations. Thus, the liver appears to be one of the major sites of T_4 conversion to T_3.

9142 THE INFLUENCE OF PORTAL PERFUSION ON THE RESPONSE TO PORTACAVAL SHUNT.

(E.) Charters, III, A. C.; Brown, B. N.; Sviolka, S. C.; Knox, D. G.; Orloff, M. J. (Sch. Medicine, Univ. California, San Diego, La Jolla, Calif.). *Am. J. Surg.* 130(2):226-232, 1975.

Detailed intraoperative pressure measurements were made in 138 unselected patients with alcoholic cirrhosis who underwent emergency portacaval shunt procedures for bleeding esophageal varices. The relations between maximum perfusion in the portal vein and postoperative survival, hepatic function and encephalopathy were examined. Pressures in the portal vein and inferior vena cava were measured with a saline manometer by direct needle puncture before and after the shunt procedure. Maximum perfusion pressure was determined by subtracting the hepatic occluded portal pressure from the splanchnic occluded portal pressure. Side-to-side portacaval shunt was used in 106 patients, end-to-side shunt in 29 patients, and another type of anastomosis in the remaining three patients. There was no correlation between maximum perfusion pressure and postshunt survival, presence and volume of ascites, liver function, hepatic failure or the development of protein-related encephalopathy. Patients with the lowest preshunt maximum perfusion pressure (≤ 100 mm saline) had the lowest survival rate (44%) and a high incidence of encephalopathy in the survivors (18%). Patients with the highest preshunt maximum perfusion pressure (>300 mm saline) had the highest survival rate (70%) and the lowest incidence of encephalopathy (8%). These results are contrary to the hypothesis that the magnitude of portal diversion and the results of portacaval shunt procedures can be predicted from the maximum shunt pressures.

9143 ^{14}C-ETHANOL BREATH TEST IN ALCOHOLIC LIVER DISEASE [abstract]. *(E.)* Dordoni, B.; Thompson, R. P. H.; Williams, R. (King's Coll. Hosp., London, England). *Gut* 16(5):400, 1975.

9144 LYMPHOCYTE CYTOTOXICITY TO ISOLATED HEPATOCYTES IN ALCOHOLIC LIVER DISEASE [abstract]. *(E.)* Cochrane, A. M. G.; Thomson, A. D.; Moussouros, A.; Portman, B.; Eddleston, A. L. W. F.; Williams, R. (King's Coll. Hosp., London, England). *Gut* 16(5):400, 1975.

9145 EPIDEMIOLOGY OF ALCOHOLIC CIRRHOSIS: INFLUENCE OF ETHNIC ORIGIN [abstract]. *(E.)* Shurberg, J. L.; Resnick, R. H.; Weinberg, G. M. (Tufts Univ. Sch. Med., Boston, Mass.). *Gastroenterology* 68(4):986, 1975.

9146 INTRADUODENAL CONCENTRATION OF BILE SALTS AND PANCREATIC FUNCTION IN PATIENTS WITH ALCOHOLIC LIVER DISEASE AND STEATORRHEA [abstract]. *(E.)* Gourgoutis, G. D. (VA Cent., Dayton, Ohio). *Gastroenterology* 68(4):902, 1975.

9147 DEOXYCHOLIC ACID (DC) METABOLISM IN PATIENTS WITH ALCOHOLIC CIRRHOSIS [abstract]. *(E.)* Knodell, R. G.; Kinsey, M. D.; Boedeker, E. C. (Walter Reed Army Inst. of Research, Washington, D.C.). *Clin. Res.* 23(3):252A, 1975.

9148 PLASMA AMINO ACIDS IN ALCOHOLIC LIVER INJURY: CONTRAST WITH PROTEIN MALNUTRITION [abstract]. *(E.)* Shaw, S.; Lieber, C. S. (Bronx VA Hosp., Bronx, N. Y.). *Clin. Res.* 23(3):459A, 1975.

9149 MORPHOLOGICAL CHANGES IN THE LIVER INDUCED BY ALCOHOL. III: CIRRHOSIS. *(Dan.)* Christoffersen, A. P. (Pathoanatomical Inst., Copenhagen Communal Hosp., Denmark). *Ugeskr. Laeger* 137(15): 851-853, 1975.

9150 STUDY AND INTEREST OF IMMUNOGLOBULIN A AND TRANSFERRIN LEVELS DETERMINATION IN ALCOHOLIC/CIRRHOSIS. *(Fr.)* Riou, J. P.; Bertrand, J. L.; Brette, R. (Hopital Debrousse, F 69322, Lyon Cedex 1, France). *Lyon Med.* 232(19):627-634, 1974.

9151 LIPID SPECTRUM OF THE BLOOD AND SOME INDICES OF THE LIVER FUNCTION IN CHRONIC ALCOHOLISM (REPORT 1). *(Rus.)* Bondar, Z. A.; Starovoitova, S. P.; Ivanets, N. N.; Makhov, V. M.; Polunina, G. N. (Faculty Clinic of Therapy, I. M. Sechenov First Moscow Medical Institute, USSR). *Ter. Arkh.* 47(2):95-100, 1975.

9152 MICROSOMAL ELECTRON TRANSPORT IN HUMAN HEPATIC MEMBRANES: INHIBITION OF REDUCTASES IN MICROSOMES FROM FATTY LIVER. *(E.)* Ozols, J. (UCONN Health Cent., Farmington, Conn.). *Fed. Proc.* 34(3):622, 1975.

9153 HEMODYNAMIC EFFECTS OF CALCIUM INFUSION IN PATIENTS WITH HYPERTENSION AND ALCOHOLIC LIVER DISEASE. *(E.)* Vlahakis, N.; Viau, A. T.; Wertheimer, L.; Naftchi, N. E. (N.Y.U. Med. Cent., New York, N.Y.). *Fed. Proc.* 34(3):368, 1975.

9154 AN IN VITRO APPROACH TO ALCOHOLIC LIVER DISEASE: INHIBITION OF TISSUE TO CULTURE CELL GROWTH BY LOW CONCENTRATIONS OF ETHANOL [abstract]. *(E.)* Miller, Jr., J. V. (UNM Med. Sch., Albuquerque, N.M.). *Clin. Res.* 23(3):253A, 1975.

9155 HEPATOMA AND ALCOHOLIC CIRRHOSIS [abstract]. *(E.)* Wilen, S. B. (SUNY-Downstate Medical Center, Brooklyn, N.Y.). *Clin. Res.* 23(3):344A, 1975.

9156 IMPAIRED UTILIZATION BY CHRONIC ALCOHOLICS OF YEAST AS A SOURCE OF FOLATES [abstract]. *(E.)* Frank, O.; Zetterman, R.; Raian, K. S.; Baker, H. (New Jersey Med. Sch., Newark, N.J.). *Clin. Res.* 23(3):458A, 1975.

9157 CONSUMPTION OF ALCOHOLIC BEVERAGES: BIOCHEMICAL AND NUTRITION-PHYSIOLOGICAL ASPECTS. *(Ger.)* Pietrzik, K.; Hotzel, D.; Sultemeier, J. (Inst. Fur Ernahrungswissenschaft, Rheinische Friedrich-Wilhems-Univ., 53 Bonn, Germany). *Dtsch. Lebensm. Rundsch.* 71(4):132-137, 1975.

9158 BODY ELECTROLYTE AND WATER COMPOSITION IN LIVER, MUSCLE, AND WHOLE BODY IN HUMAN ALCOHOLIC CIRRHOSIS [abstract]. *(E.)* Pierson, Jr., R. N.; Wang, J. (St. Luke's Hosp., New York, N.Y.). *Clin. Res.* 23(3):254A, 1975.

See also, 9132, 9136, 9182.

Cirrhosis

9159 HISTOLOGICAL-VENOGRAPHIC CORRELATES IN PORTAL HYPERTENSION. *(E.)* Bookstein, J. J.; Appelman, H. D.; Walter, J. F.; Foley, W. D., Turcotte, J. G.; Lambert, M. (Univ. Michigan Med. Cent., Ann Arbor). *Radiology* 116(3):565-573, 1975.

The morphological, physiological, and histographic features of portal hypertension were studied in 40 affected patients and 6 normal subjects using hepatic wedge venography, manometry, celiac and superior mesenteric arteriography, and endoscopy and/or barium esophagography. Biopsy material was available from 32 of the patients. Venography and manometry revealed stenosis and occlusion of the hepatic veins in 16/26 (62%) of the cirrhotic patients, most of whom also showed a sparse, uneven pattern of arborization. In a few cases a peculiar hairy pattern was observed which probably results from reticulin collapse. All cirrhotic patients had an abnormal parenchymogram which showed alternating areas of parenchyma and scarring corresponding to micronodular, intermediate, and macronodular cirrhosis. Parenchymograms were nearly normal in the patients with periportal fibrosis, while the patients with congenital hepatic fibrosis exhibited a regular pattern of lobule-sized densities. No parenchymal pattern developed in patients with Budd-Chiari syndrome or α_1-antitrypsin deficiency. The portal veins were visualized in all of the normal patients, 83% of those with cirrhosis, 75% of those with periportal fibrosis, and none of those with congenital hepatic fibrosis. Wedge pressures were elevated in 25/28 (90%) of the cirrhotic patients and in the patient with Budd-Chiari disease. Among the cirrhotic patients, no angiographic feature appeared to be of significant value in differentiating one cause from another. Apart from the fact that no patient with a normal wedge pressure had hepatic venous stenosis or occlusion, no consistent trend was observed. However, a macrolobular venographic pattern was always associated with intermediate or macronodular cirrhosis, while a lobular venographic pattern was associated with periportal fibrosis or congenital hepatic fibrosis more frequently than with cirrhosis. Thus, magnification hepatic wedge venography and manometry proved to be reasonably precise in evaluating hepatic morphology and hemodynamics in patients with portal hypertension.

9160 A NEW CASE OF HEAVY μ-CHAIN DISEASE. *(E.)* Danon, F.; Mihaesco, C.; Bouvry, M.; Clerc, M.; Seligmann, M. (Res. Inst. on Blood Diseases of the Univ. of Paris VII, Hopital Saint-Louis, Paris 10, France). *Scand. J. Haematol.* 15(1):5-9, 1975.

A new case of μ heavy chain disease (μCD) occurring in a patient living in Ivory Coast is described. A 58-yr-old Negro man had a history of abdominal distension, syphilis, onchocercosis, splenomegaly, and hematemesis. He presented with ascites, a large firm smooth spleen, portal hypertension, high splenic pressure (40 cm H_2O), and esophageal varices. Needle biopsy confirmed cryptogenic nodular cirrhosis. The patient also had gallstones, and immunofluorescence positivity for several parasitic antibodies. Serum proteins amounted to 8.2 g%. The amount of abnormal protein in the serum was great enough to give an abnormal band on routine electrophoresis. The protein was devoid of light chains and contained all the antigenic determinants found in the papain and trypsin pentameric Fc fragments. The molecular weight of the reduced and alkylated monomer of the μCD protein estimated in sodium dodecylsulfate polyacrylamide gel electrophoresis was 55,000-60,000. The corrected sedimentation coefficient was 11.9S; Cys peptides involved in three inter μchain disulphide bonds of the IgM molecules were demonstrated. Immunoelectrophoretic analysis of concentrated urine proteins showed no Bence-Jones protein and only traces of the IgM reactive component. The data suggest that the entire Fc portion, the hinge peptide, and part of the constant and variable regions of the Fd segment are present in the protein.

9161 INTRAVASCULAR COAGULATION IN CIRRHOSIS. *(Fr.)* Boureille, J.; Hayet, M.; Joram, F.; Bentot, G. (Hôpital Charles-Nicolle, 1 rue de Germont, C.H.U., F. 76038 Rouen, France). *Nouv. Presse Med.* 4(17):1267-1270, 1975.

Disseminated intravascular coagulation (DIC) was investigated in six patients in a group of 31 hospitalized cirrhotics; the six were chosen on the basis of 18 coagulation tests. Five cases were found to be serious decompensated cirrhotics with hepatic insufficiency; the sixth case was a cirrhotic treated by portacaval anastomosis. The diagnosis of DIC was difficult in cirrhotics for many reasons such as: deficit of hepatic coagulating factors, an increase of plasma volume, numerous hemorrhages requiring transfusion, thrombocytopenia and the possibilify of hyperfibrigenemia. The main features of DIC were decreases in fibrinogen, decreases in platelet count and also in differential factors of coagulation (especially proaccelerine). In three cases, none of these factors seemed to be the direct cause of DIC, which was related instead to use of diethylstilbestrol, two occurrences of streptoccal infection and a gastric cancer. In only two cases could the cirrhosis be linked to the DIC. The primary characteristic of DIC was release of thromboplastic substances into the blood. After this stage, three phases could be distinguished: (1) hypercoagulability with no clinical signs, (2) a secondary coagulation phase presenting with hemorrhages and thrombi, and (3) reactional fibrinolysis, in which the hemorrhagic syndrome worsened. In explanation of this syndrome, three hypotheses were offered: (1) that endothelial cells could release thromboplastic material, (2) hepatocellular lysis could increase during development of the disease, and (3) that thromboplastic hyperactivity could have an erythrocytic origin. In addition, other thrombogenic factors specific to cirrhotics predispose to DIC, such as: local hypercoagulability, increased hematocrit, and blood hyperviscosity, as well as consequences of hepatic insufficiency and portacaval anastomosis.

9162 ALDOLASE ISOENZYMES IN LIVER CIRRHOSIS AND PRIMARY LIVER CELL CANCER. *(E.)*

Lehmann, F. G.; Kornacher, J. (Univ. Marburg/Lahn, Marburg, Germany). *Digestion* 12(2):118-122, 1975.

Aldolase isoenzyme patterns were studied in liver cirrhosis and in primary liver cell cancer. The potential diagnostic significance of these patterns was also evaluated. Aldolase activity was assayed *via* immunotitration and immunoprecipitation; sheep antisera to human aldolase subunit A, B, and C and tissue extracts containing 5 to 10 mU of total aldolase activity were employed. In four autopsy specimens of normal livers, the mean values for aldolase A, B, and C were 5.0 ± 0.1 mU/mg, 90 ± 11 mU/mg, and 10.0 ± 0.1 mU/mg, resp. Studies of liver samples in congestive heart failure, fatty degeneration, fibrosis, cirrhosis, and primary liver cell carcinoma showed a predominance of aldolase B in all sections of benign liver diseases. The concentration of aldolase C was additionally elevated in cirrhotic tissues. Aldolase A was the main isoenzyme in the sera of 20 normal individuals, 52 patients with liver cirrhosis, and 22 patients with primary liver cell cancer. Aldolase C activities were all in the same range in the three groups. Aldolase B activities were slightly increased in 19.2% of cirrhosis patients and strongly increased in 18.2% of liver cell carcinomas. These significant variations in aldolase isoenzyme concentrations noted indicate that immunotitration is a suitable method for the differentiation of the isoenzymes in liver tissues and sera. While the shift from aldolase B to A in primary liver cell carcinoma was confirmed, the aldolase A increase was not reflected in the sera and was not found to be hepatoma-specific.

9163 IMMUNOHISTOCHEMICAL CHARACTERIZATION OF COLLAGEN IN CIRRHOSIS. *(Ger.)*

Remberger, K.; Gay, S.; Fietzek, P. P. (Pathologisches Institut, Universitat, D-8000 Munchen 15, Thalkirchner Str. 36, Germany). *Virchows Arch.* [*Pathol. Anat.*] 367(3):231-240, 1975.

Collagen was stained by the indirect immunofluorescence technique in liver slices obtained at autopsy from 21 patients with cirrhosis (16 men and 6 women, aged 26-79 yr; mean age 55.5 yr). Cirrhosis was caused by alcoholism (11 cases), chronic hepatic dystrophy (2 cases), and by chronic aggressive hepatitis, chronic cholangitis, and Thorotrast (1 case each). In five cases the cause of the cirrhosis could not be established histologically or through the patient's history. Cirrhosis was associated with primary liver cancer in four cases (2 hepatocellular carcinomas, 1 mixed cell carcinoma, and 1 cholangiocarcinoma). The patient with Thorotrast-induced cirrhosis had a hemangiosarcoma. Controls consisted of young accident victims and patients with hepatic dystrophy caused by congestive heart failure and veno-occlusive disease. While narrow bands of type III collagen were found along the hepatocyte trabeculae and sinusoid endothelium and in the walls of central veins in the normal liver, no type II collagen was found at all and type I was detected only in the walls of large blood vessels. The findings were similar in the cirrhotic liver: type III collagen deposits were increased in the dilated portal fields, connective tissue septa, and regenerating nodules, but type I was present only in the walls of large arteries and type II was not detected at all. There was no difference in collagen distribution in the various types of cirrhosis. Connective tissue in the cholangiocarcinoma and hemangiosarcoma gave a positive reaction for type III collagen, but in hepatocellular carcinomas type III collagen was present only in narrow areas and not all cell trabeculae in the hepatoma nodes were surrounded by type III collagen fibrils. These results confirm the results of previous biochemical studies in which 40% of the total collagen content was identified as type III. Electron microscope investigations have demonstrated that collagen in cirrhotic livers which cannot be identified as type III is present as segment long-spacing crystallites similar to type I. However, since the chromatographic behavior of this collagen and its immunohistochemical and serological reactions differ from those of type I collagen, it is apparently a new, possibly pathological type of collagen which has not previously been described.

9164 IMMUNE COMPLEX TYPE GLOMERULONEPHRITIS IN CIRRHOSIS OF THE LIVER. *(E.)*

Callard, P.; Feldman, G.; Prandi, D.; Belair, M. F.; Mandet, C.; Weiss, Y.; Druet, P.; Benhamou, J. P.; Bariety, J. (Hop. Broussais, Paris, France). *Am. J. Pathol.* 80(2):329-340, 1975.

Kidney biopsy specimens from 10 patients with histologically proven cirrhosis and portal hypertension and 10 controls with normal livers and no evidence of renal disease were examined by light, electron, and immunofluorescence microscopy. In addition, determinations of urinary protein, Addis count, serum creatinine, blood urea, blood glucose, serum cryoglobulin, serum hepatitis B surface antigen (HBsAg), and serum IgG, IgA, and IgM were performed. Marked glomerulosclerosis was found in 6 of the cirrhotic patients and a milder form in 3 others. The glomerular lesions were characterized by: thickening of the basement-membrane-like material; electron-dense deposits in the mesangial areas and in the capillary walls; round areas of rarefaction in the membrane-like material and in some deposits; and the presence of IgA, often associated with other immunoglobulins and the C_3 component of complement in the deposits. None of the patients had proteinuria, renal insufficiency, or arterial hypertension, and only 1 patient each had microscopic hematuria and serum HB$_s$Ag. Serum C3 levels were low in 3 patients, serum IgA was elevated in 7 patients, serum IgG was increased in 5 patients, serum IgM was normal, and a cryoglobulin was detected in 4 patients. Four of the control subjects also had glomerulosclerosis, but immunofluorescence was negative in most subjects and the results of all laboratory investigations were normal. Glomerulonephritis in patients with cirrhosis of the liver may result from precipitation of either aggregated immunoglobulins or circulating immune complexes in the glomeruli.

9165 URINARY KALLIKREIN EXCRETION IN CIRRHOSIS.

(It.) Greco, A. V.; Porcelli, G.; Ghirlanda, G.; Altomonte, L.; Croxatto, H. (Universita Cattolica S. Cuore, Istituto Pathologia Speciale Medica, Rome, Italy). *Minerva Med.* 66(26):1504-1508, 1975.

Kallikrein determinations were performed on 24-hr urine specimens from 33 patients with alcoholic cirrhosis (31 men and 2 women, aged 27-66 yr) which was accompanied by ascites in 22 cases and by esophageal varices in 20. In most cases, the diagnosis was established by biopsy and, in some cases, by autopsy. None of the patients had increased blood urea nitrogen or creatinine levels, their pancreatic function was within normal limits, and none of the patients had arterial hypertension or diabetes. For several days before urine was collected, none of the patients received low-sodium diets or vitamin K, diuretics, steroids, or other drugs. Controls consisted of 22 men (aged 19-40 yr) with normal blood pressure, normal blood sugar levels, and normal liver and kidney function. After precipitation of protein from urine with acetone, 24-hr dialysis with running water, and removal of insoluble material by centrifugation, esterase activity was determined in 1 ml of urine extract spectrophotometrically, using benzoylarginine ethyl ester (BAEE) as substrate. Values for urinary kallikrein excretion, expressed in esterase U (1 esterase U is equivalent to the hydrolysis of 0.05 μM BAEE/min), ranged from 13.20 to 39.50 esterase U/24 hr (mean 24.44 ± 1.66 esterase U/24 hr) in controls and from 18.68 to 82.50 esterase U/24 hr (mean 39.42 ± 2.84 esterase U/24 hr) in patients with cirrhosis. The increase in urinary kallikrein excretion in cirrhosis was highly significant, with the highest values being found in patients with ascites. Since there is a functional relation between urinary kallikrein and the renin-angiotensin-aldosterone system, the high values for urinary kallikrein excretion found in cirrhotics might be correlated with increases in renin and aldosterone which have been reported to occur in cirrhosis.

9166 PATHOGENESIS OF RENAL FAILURE IN CIRRHOSIS AND FULMINANT HEPATIC FAILURE.

(E.) Wilkinson, S. P.; Portmann, B.; Hurst, D.; Williams, R. (King's Coll. Hosp., London S.E.5, England). *Postgrad. Med. J.* 51(598):503-505, 1975.

Literature concerning the pathological characteristics of acute renal failure in cirrhosis and fulminant hepatic failure is discussed. The measurement of urinary lysozyme concentrations is suggested to be an index of tubular integrity. In 19 of 37 patients with renal failure and associated fulminant hepatic failure or cirrhosis, normal urinary lysozyme concentrations indicated intact tubular function. A continuous range of concentrations have been found in both fulminant hepatic failure and cirrhosis, suggesting a complete spectrum of renal failure. Examination of 64 patients dying of fulminant hepatic failure demonstrated that renal failure does not reflect the severity of the hepatocellular destruction. Factors precipitating functional renal failure include gastrointestinal hemorrhage, infection, and paracentesis abdominis. Plasma expansion values are normal or elevated in patients with fulminant hepatic failure and functional renal failure. Renal arteriograms show the mechanism of the functional renal failure of cirrhosis to be a profound vasoconstriction of the major branches of the main renal artery and intrarenal vessels. Whereas systemic endotoxemia was found only in patients with a glomerular filtration rate of 25 ng/ml, serial studies indicated renal failure development shortly after endotoxemia detection. Both fulminant and functional renal failure were seen in relation to endotoxemia. Whereas a strongly positive limulus assay was found in only one of ten patients with functional renal failure and cirrhosis, it is suggested that the effective endotoxin concentrations are not always detectable by this assay. This functional renal failure is due to active renal vasoconstriction, which may be due to systemic endotoxemia.

9167 RENAL RETENTION OF SODIUM IN CIRRHOSIS AND FULMINANT HEPATIC FAILURE.

(E.) Wilkinson, S. P.; Moodie, H.; Alam, A.; Williams, R. (King's Coll. Hosp. and Medical Sch., Denmark Hill, London S.E.5, England). *Postgrad. Med. J.* 51(598):527-531, 1975.

The relative roles of changes in intrarenal hemodynamics and hyperaldosteronism in the pathogenesis of sodium retention were evaluated in patients with cirrhosis and a glomerular filtration rate greater than 90 ml/min. No relation of sodium excretion (2-74 mEq/day) with glomerular filtration rate could be found. Using the technique of deconvolution analysis of a ^{131}I-hippuran renogram, it is concluded that while intrarenal redistribution of blood flow occurs in cirrhosis, it is not directly related to sodium excretion. An inverse hyperbolic relationship between sodium excretion and urinary aldosterone 18-glucuronide was found. In evaluating possible factors leading to hyperaldosteronism, a close correlation was found between increased plasma renin activity and increased aldosterone excretion. While impaired degradation by the liver may be a contributory factor, increased secretion was deemed quantitatively more important. In addition, cirrhosis patients with a redistribution of blood flow away from the outer cortex (without detectable ascites) had significantly higher values for plasma renin activity than those with a normal pattern of intrarenal blood flow distribution. Escape from the sodium-retaining effects of hyperaldosteronism was dependent on the expansion of the effective total extracellular fluid, which in turn was dependent upon ascites formation. In both moderate and markedly reduced renal perfusion (20-90 ml/min), sodium retention is thus concluded to be a result of a combination of hyperaldosteronism and reduced perfusion. Data on renal function in fulminant hepatic failure suggest the nephron proximal tubule as a site of abnormal sodium retention.

9168 STUDIES OF RENIN AND ALDOSTERONE IN CIRRHOTIC PATIENTS WITH ASCITES.

(E.) Rosoff, L., Jr.; Zia, P.; Reynolds, T.; Horton, R. (Los Angeles County Univ. South. California Med. Cent.). *Gastroenterology* 69(3):698-705, 1975.

The effects of posture, dietary salt intake, drug-induced diuresis, and blockage of aldosterone biosynthesis on plasma renin activity and the metabolic clearance rate of aldosterone were investigated in 9 patients with severe alcoholic liver disease and refractory, moderately tense ascites; all but 1 of these patients had avid renal sodium retention. Determinations were also made of urinary volume, urine electrolytes, serum urea, serum nitrogen, serum creatinine, and plasma cortisol. All patients initially showed marked elevations in plasma renin and aldosterone concentrations while in the supine position. Both parameters showed further significant increases after the patients stood erect for 1 hr, but these increases were not as great as those observed in normal subjects. The plasma aldosterone concentrations increased largely as a result of increased aldosterone secretion rather than of decreased metabolic clearance. Sodium restriction to 20 mEq/day for 1 week had no significant effect on the mean plasma renin or aldosterone values, while administration of furosemide (40 mg twice a day) and triamterene (100 mg twice a day) to stimulate diuresis was associated with a moderate decrease in supine plasma aldosterone in 1 patient and no change in another. However, in 4 of 6 patients undergoing spontaneous diuresis the plasma renin activity and plasma aldosterone concentration returned to normal. Aminoglutethimide treatment (1-2 g/day p.o.) combined with dexamethasone (0.5 mg twice a day) caused marked and rapid decreases in the supine plasma aldosterone concentrations in all 3 patients studied; in 2 of these patients there was a slight rise in the plasma renin activity. Significant increases in diuresis did not occur, even after 2 weeks of treatment. Sodium excretion was poorly correlated with plasma renin activity and plasma aldosterone. The data suggest that renal tubular events independent of hyperaldosteronism play an important role in the sodium retention observed with cirrhosis and ascites.

9169 OUR EXPERIENCE IN THE TREATMENT OF CIRRHOTIC ASCITES BY REINJECTION OF CONCENTRATED ASCITES FLUID.

(Fr.) Terrasse, J.; Moinade, S.; Coignet, F. (No affiliation given). *Rev. Fr. Gastroenterol.* (106):7-8, 11-14, 17, 1975.

Treatment of cirrhotic ascites by reinjection of concentrated ascitic fluid is a procedure used when patients are classified as "untreatable" after prolonged medical treatment. The patient pool comprised 18 subjects (3 women and 15 men, mean age 55 yr). The treatment was a low-salt diet with repeated ascites punctures, diuretics and albumin injections. A procedure of reinjection of concentrated ascitic fluid using the Rhodiascit released water and sodium and retained proteins. This resulted in decreased edema in the legs and the blood volume returned to normal levels. The indications for the reinjections were: the ascites was not affected by diuretics (9 cases), preoperative preparation for an APC (1 case), celiac surgery (1 case), functional renal insufficiency (6 cases) and the threat of umbilical rupture (1 case). Tolerance for reinjection was remarkable. The side effects were few and of short duration. They included temperature elevation, chills, lumbar pains, and intense asthenia. Most of these effects were the functions of the concentration of the reinjected material. Deaths during reinjection resulted from the disseminated intravascular coagulation and fibrinolysis. Overall, this therapeutic procedure is most beneficial for the patient.

9170 CONCENTRATION-REINFUSION (CR) OF ASCITIC FLUID IN THE TREATMENT OF DECOMPENSATED LIVER CIRRHOSIS WITH DIURETIC-RESISTANT ASCITES.

(E.) Venture, E.; Zeneroli, M. L. (Inst. Clinical Medicine, Univ. Modena, Modena, Italy). *Postgrad. Med. J.* 51(598):577-580, 1975.

The application of the concentration-reinfusion (CR) technique was evaluated in 20 cases of liver cirrhosis with diuretic-resistant ascites. During the CR procedure, both water and electrolyte excretion were markedly increased. There was also an increase in glomerular filtration rate and in urinary Na/K ratio. Body weight was significantly decreased. The acute effect of CR on water and sodium diuresis disappeared within 48 hr from the start of the procedure. Subsequent administration of saluretic and potassium-sparing drugs acting at different levels of the renal tubule again induced diuresis and completed the removal of the ascites. In patients with ascites and massive edema, as well as low serum albumin levels and renal failure, a delayed diuretic response to CR is almost the rule and may be dangerous because of fluid overload. In cases such as these a forced saluresis needs to be induced by using frusemide to prevent possible cardiovascular complications. In all of these patients the CR technique was well tolerated; the only consistent side effects were mild fever, transient thirst, and hypotension. Two of the patients died at 7 and 10 days after CR for massive gastrointestinal bleeding. Six patients were controlled as out-patients by conventional diuretic drugs for 4 to 8 months. It is stressed that the ascites CR technique as current therapy is probably too expensive and should not be viewed as a substitute for the diuretic drugs in diuretic-responsive ascites. However, it is concluded to be an important method in the management of diuretic-resistant ascites.

9171 INFLUENCE OF AZATHIOPRINE ON CIRRHOSIS IN HUMANS AND IN ANIMAL EXPERIMENTS.

(Ger.) Perings, E.; Brunner, G.; Creutzfeldt, W. (Med. Clin., Gottingen Univ., Germany). *Verh. Dtsch. Ges. Inn. Med.* 79:946-948, 1973.

Improvements in serum transaminase activities, γ-globulin levels, and histological findings occurred in about 90% of 54 patients with chronic aggressive hepatitis after administration of 2 to 3 mg/kg/day of azathioprine for as long as eight yr. In contrast, 10 of 21 patients with cirrhosis died during azathioprine therapy or shortly after its discontinuation and showed less improvement in liver function tests and histological findings than patients with chronic aggressive hepatitis. To account for the deleterious effect of azathioprine in cirrhosis, experiments were performed on 122 male Wistar rats with cirrhosis induced by administration of carbon tetrachloride (CCl_4; 0.75 ml/kg twice a week, s.c.) and on 30 rats with cirrhosis induced by a choline-deficient diet. Rats were given: (1) 26 CCl_4 injections, followed by 25 mg/kg/day of azathioprine, p.o., and six more injections of CCl_4; (2) 35 CCl_4 injections, followed by 25 mg/kg/day of azathioprine, p.o. for 36 days; (3) 34 CCl_4 injections, followed (10 days later) by 25 mg/kg/day of azathioprine, p.o. for four wk; and (4) a choline-deficient diet for eight months, followed by 25 mg/kg/day of azathioprine, p.o. for four wk. Controls for groups 3 and 4 received 1 ml/day of water, p.o. In all four groups, about 50% of the rats given azathioprine died within four wk. Of 62 controls with cirrhosis, only three died during the same period. Azathioprine-treated rats in groups 1 and 2 also had significantly higher SGOT and SGPT activities than untreated controls. A good correlation was found between histological findings and serum transaminase activities, both in cirrhosis induced by CCl_4 and that induced by a choline-deficient diet. To rule out the toxic effect of azathioprine, 25 mg/kg/day was administered to 20 healthy rats for 90 days. No histological changes in the liver or increases in serum transaminase activities were observed. These findings suggest that azathioprine is metabolized more slowly in rats with parenchymal liver damage and that it produces damage by flooding their liver cells. On the basis of these results, it is concluded that cirrhosis is a contraindication for azathioprine therapy.

9172 EFFECTS OF CLOFIBRATE IN PRIMARY BILIARY CIRRHOSIS HYPERCHOLESTEROLEMIA AND GALLSTONES. *(E.)* Summerfield, J. A.; Elias, E.; Sherlock, S. (Royal Free Hosp., London, NW3 2QG, England). *Gastroenterology* 69(4):998-1000, 1975.

The effects of clofibrate in a patient with primary biliary cirrhosis are reported. The 52-yr-old woman developed xanthelasma, pruritus, and jaundice, and was given short courses of treatment with corticosteroids and cholestyramine. One gram of clofibrate per day was administered for two months. The patient developed pruritis, jaundice, nausea, and epigastric discomfort, upon which the clofibrate was discontinued. Serum cholesterol was 1,700 mg/dl. A retrograde endoscopic cholangiogram showed multiple intrahepatic gallstones, and a liver biopsy showed a severe periportal cholestasis. Serum cholesterol dropped to 1,125 mg/dl one month after the administration of clofibrate was discontinued, at which time administration of cholestyramine (12 g/day) and chenodeoxycholic acid (125 mg/day) were commenced. Within three months, the serum cholesterol dropped to 665 mg/dl and the stones disappeared. The patient's response is consistent with previously reported observations. The author concludes that the paradoxical rise in serum cholesterol may be reconciled with the production of lithogenic bile and stone formation.

9173 COGNITIVE DEFICITS ASSOCIATED WITH CHRONIC HEPATIC ENCEPHALOPATHY AND THEIR RESPONSE TO LEVODOPA. *(E.)* Elithorn, A.; Lunzer, M.; Weinman, J. (Royal Free Hosp., Pond Street, London, N.W.3, England). *J. Neurol. Neurosurg. Psychiatry* 38(8):794-798, 1975.

The effect of levodopa on patients with chronic hepatic encephalopathy (CHE) was investigated. A battery of computer based psychological tests was given to seven patients with established CHE, seven control patients with cirrhosis, and seven patients without liver disease. The groups were matched for sex, age (53.6-55.8 yr), and verbal IQ. The battery included measures of route-finding, coding, short-term memory, multiple choice, and simple reaction time and motor tapping. The CHE patients had lower mean scores on all tests than either of the two control groups; the impairment was most marked on speed-based measures and short-term memory. Administration of levodopa to four patients resulted in an overall improvement, which was still below the performance level of the control groups. The patients had improved scores on speed-based tests, yet did less well on tests of memory and attention; hence, a mixed effect of levodopa on cognitive skills is apparent. An unexpected finding was the evidence of intellectual loss found in two patients with liver disease and undiagnosed encephalopathy. It is concluded that levodopa has both an anti-depressant and stimulatory effect. Its effect on intellectual functions is secondary to the stimulatory effect and is consequently dependent upon the emotional and attentional status of the patient.

9174 EFFECT OF PORTACAVAL ANASTOMOSIS ON RENAL BLOOD FLOW IN CIRRHOSIS--PRELIMINARY RESULTS. *(E.)* Ring-Larsen, H.; Hesse, B.; Stigsby, B. (Univ. Hosp., Copenhagen, Denmark). *Postgrad. Med. J.* 51(598):499-502, 1975.

The influence of the augmented portal pressure and the postulated "diminished effective circulating plasma volume" on the renal blood flow in patients with cirrhosis of the liver was investigated. Six patients with cirrhosis and portal hypertension had undergone hemodynamic investigation before and after portal decompression; all but one had and end-to-side portacaval shunt. The shunt caused a significant fall in the splenic pressure in all patients; however, the pressure was not always completely normalized. Liver function tests for galactose elimination capacity remained unchanged in 80%, as did pulse rate, mean arterial blood pressure, and renal vascular resistance. The right atrium, wedged pulmonary artery, and wedged hepatic vein pressures also remained unchanged. The plasma volume generally increased after surgery from 3.50 l to 3.65 l. Cardiac output was greater after anastomosis (5.15 l/min before, and 6.85 l/min after), caused exclusively by an increased stroke volume from 67 ml to 88 ml. The study did not establish a relation between recovery of renal perfusion and portacaval end-to-side anastomosis. The possible effects of a side-to-side shunt plus the theory of circulating vasoactive agents were considered.

9175 PROGNOSIS AFTER PORTOCAVAL ANASTOMOSIS: A 15-YEAR FOLLOW-UP. *(E.)* Windle, R.;

Peacock, J. H. (Royal Infirmary, Bristol, England). *Br. J. Surg.* 62(9):701-706, 1975.

Fifty-seven patients who had undergone portacaval anastomosis more than 15 yr ago were studied to ascertain the late effectiveness of the operation in the stopping of bleeding and the resultant side effects. There were 35 males and 22 females (average age 33 yr). Four patients (7%) died during the postoperative period, 25 died subsequently, and 27 (48.2%) were alive at the time of the study. The cause of death was hepatic failure in 68% of those who did not survive. Encephalopathy developed in 19% of the patients within five yr of the operation; an additional eight patients developed encephalopathy within the next five yr. Further hemorrhage occurred in eight patients, peptic ulceration in eight, and diabetes mellitus in five. Of the 34 patients with cryptogenic cirrhosis surviving the postoperative period, 22 (64%) were alive after 15 yr; deaths had resulted from hepatic failure, respiratory complications, pyosalpinx, peptic ulcer hemorrhage, and cardiac failure. Eighty-two percent of the patients with this type of cirrhosis who were under 30 yr at operation were alive after 15 yr; none of the patients over 40 yr at operation were alive at this time. Of the 22 survivors with cryptogenic cirrhosis, liver function tests remained unchanged in nine, deteriorated with subsequent recovery in six, and deteriorated without remission in five. All nine patients with a history of jaundice prior to cirrhosis died within 13 yr of surgery. The results may suggest that young cryptogenic cirrhotic patients with no encephalopathy are best benefitted by the surgery. A poor prognosis is suggested by deterioration in liver function, and the development of encephalopathy may indirectly indicate a poor long-term prognosis.

9176 INTERFERENCE WITH SYMPATHETIC FUNCTION AND CATECHOLAMINE RESPONSIVENESS IN LIVER DISEASE [abstract]. *(E.)* Manghani, K. K.; Ginsburg, J.; Newman, S. P.; Bernard, A. G.; Lunzer, M. R.; Sherlock, S. (R. Free Hosp., London, England). *Gut* 16(5):399-400, 1975.

9177 PORTAL HYPERTENSION INDUCED BY VINYL CHLORIDE [abstract]. *(E.)* Smith, P. M.; Williams, D. M. J.; Crossley, I. R. (Llandough Hosp., Penarth, Glamorgan, England). *Gut* 16(5):402-403, 1975.

9178 A TRIAL OF COLCHICINE IN LIVER CIRRHOSIS [abstract]. *(E.)* Kershenobich, D.; Uribe, M.; Rojkind, M. (Instituto Nacional de la Nutricion, Mexico, D. F.). *Gastroenterology* 68(4):1078, 1975.

9179 PRESENCE OR ABSENCE OF ESOPHAGEAL VARICES (EV) ON PROGNOSIS IN CIRRHOSIS: A PROSPECTIVE INVESTIGATION [abstract]. *(E.)* Snyder, N.; Reboucas, G.; Brodoff, M.; Conn, M. B.; Conn, H. O. (VA Hosp., West Haven, Conn.) *Gastroenterology* 68(4):1070, 1975.

9180 EFFECT OF PORTACAVAL ANASTOMOSIS ON HYPERSPLENISM IN CIRRHOSIS: A PROSPECTIVE CONTROLLED EVALUATION [abstract]. *(E.)* Mutchnick, M. G.; Lerner, E.; Conn, H. O. (VA Hosp., West Haven, Conn.). *Gastroenterology* 68(4):1070, 1975.

9181 SULFATION AND REHYDROXYLATION OF DEOXYCHOLIC ACID (DCA) IN ALCOHOLIC CIRRHOSIS: A DETERMINANT OF LOW BILIARY DCA [abstract]. *(E.)* Mehta, S.; Kaye, M.; Davis, R.; Struthers, J.; Naylor, J. (VA Hosp., Denver, Colo.). *Gastroenterology* 68(4):1060, 1975.

9182 STEATOSIS OR ALCOHOLIC HEPATITIS AS PRECURSORS OF CIRRHOSIS [abstract]? *(E.)* Bordalo, O.; Batista, A.; Noronha, M. (Hosp. Santa Maria, Lisbon, Portugal). *Gastroenterology* 68(4):867, 1975.

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See also, 8517, 8531, 8540, 8615, 8909, 8952, 8960, 8971, 8973, 8981, 9023, 9026, 9044, 9092, 9132, 9139, 9141, 9147, 9155, 9156, 9158, 9214.

LIVER AND BILIARY TRACT

Gallbladder and Biliary Tract Diseases

9214 PRIMARY BILIARY CIRRHOSIS WITH CANCER OF THE AMPULLA OF VATER. *(E.)* Makipour, H.; Winkelman, E. I. (no affiliation given). *Cleveland Clin. Q.* 42(2):209-213, 1975.

A case of carcinoma of the ampulla of Vater occurring with primary biliary cirrhosis is reported. A 57-yr-old white woman was hospitalized with jaundice and diarrhea of 8 to 9 months duration, mild right upper quadrant abdominal discomfort, generalized bone pain, weight loss, scleral icterus, and multiple spider angiomas on the face and neck. The spleen was palpable 2 cm below the left costal margin and the liver span was 30 cm. Antimitochondrial antibody was positive at greater than 1:160 serum dilution, and smooth muscle antibody and antinuclear factor were negative. A cork bore biopsy of the liver showed portal fibrosis and chronic inflammatory infiltrate comprised of lymphocytes and plasma cells. The ducts were reduced and replaced by ill-defined lymphoid aggregates. The findings were compatible with primary biliary cirrhosis, for which a high protein diet and diphenoxylate hydrochloride were prescribed. During the following 6 months, the patient developed pruritus and continued to have diarrhea and weight loss. Results of a second physical examination were similar to those of the first except for the presence of bilateral periorbital xanthelasma. At laparotomy, a 3.5-cm, firm, rubbery mass was found in the head of the pancreas. Operative cholangiogram showed complete obstruction of the distal common duct with proximal dilatation. Needle biopsy specimens of the pancreas indicated pancreatitis and a transduodenal biopsy of the ampulla of Vater showed well-differentiated adenocarcinoma. A Whipple's procedure was performed three wk later, and the patient was discharged on a regimen of pancreatin, cholestyramine, and diphenoxylate hydrochloride. Over the next 30 months she continued to have severe diarrhea with generalized bone pain due to demineralization of all bony structures; her stool fat was 272 g/72 hr. The patient died following the development of hepatoencephalopathy. Autopsy revealed no recurrence of metastatic tumor, but showed a small calculus in the pancreatic duct. This case demonstrates the value of the antimitochondrial antibody and the potential role of endoscopic retrograde cholangiopancreatography in establishing a correct diagnosis.

9215 EMPHYSEMATOUS CHOLECYSTITIS. *(Ger.)* Muller, K. H. G. (Katharinenhospital, D-7000 Stuttgart-1, Kriegsbergstr. 60, Germany). *Leber Magen Darm* 5(1):18-20, 1975.

A case report is presented for a 62-yr-old man with a two-yr history of recurrent pain in the right upper abdomen who was hospitalized for acute colic. Cholecystography in the supine and upright positions showed a fluid level in the gallbladder but no gas could be detected in the extrahepatic biliary tract. Tomography revealed that the common bile duct was normal in diameter and could be filled with contrast medium. Since the patient had undergone a Billroth II procedure many years before, the duodenum could not be filled with contrast medium and a biliary fistula could not be ruled out. At surgery, a tumor-like abscess the size of a fist was found adhering to the anterior wall of the abdomen. Inside of this abscess there were small stones, a tissue sequestrum which resembled the gallbladder, and brownish pus. No fistula was found between the duodenum and the inside of the abscess. Histological examination showed complete necrosis of the gallbladder. *Escherichia coli* was cultivated from the pus. The patient recovered uneventfully after surgery and antibiotic therapy. This is the 85th case of emphysematous cholecystitis reported in the literature.

9216 VOLVULUS OF THE GALLBLADDER: CASE REPORT AND REVIEW OF THE LITERATURE. (*E.*) Echave, V.; Hampson, L. G. (Montreal General Hosp., 1650 Cedar Ave., Montreal, Quebec, H3G 1A4, Canada). *Can. J. Surg.* 18(5):439-442, 1975.

A case of volvulus of the gallbladder in an 87-yr-old woman is reported. The patient was hospitalized with a severe colic-like pain in the right upper abdominal quadrant of a few days duration. The pain was associated with nausea, but not with vomiting, and the patient had no known history of jaundice, although she did have a 20-yr history of relatively asymptomatic gallstones. Examination revealed guarding in the upper abdomen, a positive Murphy's sign, and no palpable masses. Chest radiography revealed an elevated right hemidiaphragm, calcification of the aorta, and degenerative changes in the spine; abdominal radiographs visualized a single calculus in the region of the gallbladder and feces and air in the colon. Initial treatment consisted of nasogastric suction and i.v. fluids, but the patient's condition did not change appreciably. Laparotomy on the fifth day of hospitalization revealed a greatly distended, completely gangrenous, and excessively mobile gallbladder with little surrounding inflammation. A 270-degree clockwise torsion at the level of the cystic duct was due to an elongated gallbladder mesentery arising from a short base in the liver bed. Detorsion was accomplished, the gallbladder was removed, and the patient recovered. Pathological examination showed evidence of gangrene of the gallbladder and cholelithiasis. Three anatomic abnormalities may lead to volvulus of the gallbladder: the gallbladder lying free in the peritoneal cavity; acquired mesentery; and spinal deformities. The condition is frequently associated with cholelithiasis and is most common in elderly women. It should be included in the differential diagnosis of the acute abdomen, particularly in older women with right upper quadrant pain. The treatment is early cholecystectomy.

9217 ANGIOGRAPHIC FINDINGS IN PATIENTS WITH CHOLEDOCHOLITHIASIS AND OBSTRUCTIVE JAUNDICE. (*E.*) Bree, R. L.; Reuter, S. R. (Univ. Michigan Med. Cent., Ann Arbor). *Radiology* 112(2):291-295, 1974.

Hepatic angiograms of 10 patients with impacted common duct stones and severe jaundice were studied to determine the effects of obstructive jaundice on the angiogram and to determine if inflammatory changes caused by gallstones could be misinterpreted as tumors. Ascending cholangitis was also present in 6 patients. Simultaneous or sequential celiac and superior mesenteric angiography was performed in each patient, and 4 patients had supplemental common hepatic or gastroduodenal angiograms. The angiograms were evaluated for the presence of increased hepatic arterial blood flow and for abnormal vessels in the region of the common duct. Nine of the patients had dilated hepatic arteries, the average diameter of the common hepatic artery being 8.3 cm. An increased number of small artery branches were present in 8 patients, and 3 patients showed duplication of the small hepatic artery branches. The density of the hepatogram was increased in 7 cases. Thus, all 10 patients had more than one angiographic indication of increased hepatic artery blood flow. A nonhomogeneous hepatogram consisting of a patchy mottled appearance throughout the liver was present in 7 cases. Two patients with particularly nonhomogeneous hepatograms and rounded defects, probably representing dilated hepatic ducts, were misdiagnosed preoperatively has having hepatic metastases. No abnormal vessels were present in the region of the common duct or ampulla of Vater in any case, and no patient was diagnosed as having carcinoma of the biliary tract. The results suggest that the diagnosis of hepatic metastasis be made with circumspection in patients with obstructive jaundice. Additional evidence of metastases should be required for such a diagnosis.

9218 THE ENDOSCOPIC INTRAHEPATIC CHOLANGIOGRAM. CLINICOPATHOLOGIC CORRELATION WITH POSTMORTEM CHOLANGIOGRAMS. (*E.*) Falkenstein, D. B.; Riccobono, C.; Sidhu, G.; Abrams, R. M.; Seliger, G.; Zimmon, D. S. (Manhattan Veterans Admin. Hosp., New York, N.Y.). *Invest. Radiol.* 10(4):358-365, 1975.

In order to aid in the interpretation of intrahepatic cholangiographic patterns obtained during endoscopic retrograde cholangiography, postmortem cholangiographic patterns were correlated with pathologic anatomy. Postmortem cholangiography of the normal biliary tree (of 30 subjects) identified and made possible the naming of the major segmental intrahepatic bile ducts. The retrograde intrahepatic cholangiographic pattern in a normal liver showed smoothly tapering, gently sinuous bile ducts, ramifying outward toward the hepatic surface. In cirrhosis, the biliary tree of nodular livers appeared shrunken with generalized crowding of intrahepatic bile ducts. The finer radicles of the biliary tree exhibited a distinct zig-zagging and corkscrewing. The biliary tree in infiltrative parenchymal process revealed cholangiographic patterns of straightening and elongation of intrahepatic biliary radicles. The bile ducts were spread apart and sometimes extended across the entire upper abdomen. In hepatic tumors, diverse cholangiographic patterns were seen; solitary mass lesions caused smooth, sweeping displacements of intrahepatic bile ducts while metastatic tumors frequently enveloped and compressed intrahepatic bile ducts. A distinctive pattern of segmental bile duct narrowing with peripheral dilatation was sometimes observed. Large solid intrahepatic tumors were observed that completely blocked an intrahepatic bile duct. If metastases are widespread, a combination of bile duct deviation, stenosis, dilatation or block may occur.

9219 OPERATIVE CHOLANGIOGRAPHY: EVALUATION AND A PLEA FOR ITS GENERAL USE.

(*E.*) Nanson, E. M. (Sch. Medicine, Univ. Auckland, Auckland, New Zealand). *Can. J. Surg.* 18(5):449-458, 1975.

The indications for operative cholangiography are evaluated *via* analysis of the records of 109 females and 42 males (mean age 47 yr) undergoing biliary tract surgery, and the technique itself is reviewed. Operative cholangiography was used in 133 of the 151 biliary surgery patients. Among the 18 in whom it was not performed, 14 underwent cholecystectomy and four underwent choledochostomy. Operative cholangiography was not performed in three patients for plausible reasons, but it should have been performed in the other cases. Among the 133 patients in whom operative cholangiography was used, 119 underwent cholecystectomy. In this subgroup of 119 patients, 5 of 88 patients in whom no abnormality of the common bile duct was suspected had "occult" stones and 10 of 31 patients in whom an abnormality of the common bile duct was suspected were shown to have no abnormality; there were no false-negative results. Indications for operative cholangiography include: demonstration of unsuspected stones in the common bile duct; avoidance of unnecessary exploration of the common bile duct; demonstration of abnormal anatomy; demonstration of the nature of the obstruction of the ampulla of Vater; tumors of the intrahepatic biliary tree; establishment of a diagnosis of stenosing cholangitis, cholangiolytic jaundice, or choledochal cyst; clarification of the approach to stones impacted at the lower end of the common bile duct; and demonstration after exploration that the common bile duct contains no stones. The technique of operative cholangiography is simple, but success requires frequent use by a regular team and meticulous attention to details, such as: positioning of the patient and of the diathermy body plate, removal of instruments from the x-ray field, opacification of duct systems, use of the scout film and radiographic technique, injection of contrast medium, and use of the "completion" cholangiogram. In conclusion, operative cholangiography has largely taken the guesswork out of biliary surgery; it carries no significant risk of mortality or morbidity and is an added safeguard for the patient.

9220 AN ALTERNATIVE TO ROUTINE OPERATIVE CHOLANGIOGRAPHY.

(*E.*) Day, S. W.; Wagner, C. L.; Kranz, J. M. (No affiliation given). *Am. Surg.* 41(9): 543-545, 1975.

The use of the Fogarty biliary balloon catheter for exploration of the common duct was appraised in a retrospective review of 135 cases undergoing cholecystectomy. In 60 of these patients, cholecystectomy revealed evidence of bile duct calculus (large duct-small stones, jaundice, cloudy bile, pancreatitis, palpable stone, cholangitis, acute cholecystitis) and further exploration with the balloon catheter was undertaken. Stones were found in 33% of those studied in this manner. All explored patients had a T-tube cholangiogram during the postoperative period and no residual stones were found. The finding of small stones or large ducts during common duct exploration was not a very useful indicator of the presence of common duct stones, although both together constituted a much better indication. Similarly, jaundice alone was not a good indicator, but it was significant when combined with other findings. Acute cholecystitis was a good indicator of common duct stones. The results indicate that balloon catheter exploration in conjunction with a careful anatomic dissection of the biliary system constitutes a safe alternative to routine operative cholangiography in many cases. Where the yield of stones is low by exploration, a cholangiogram should be performed.

9221 THE NONOPACIFIED GALLBLADDER ON ORAL CHOLECYSTOGRAPHY.

(*E.*) Mujahed, Z.; Evans, J. A.; Whalen, J. P. (New York Hosp.-Cornell Medical Center, New York, N. Y.). *Radiology* 112(1):1-3, 1974.

Nonopacification of the gallbladder on oral cholecystography was studied by reviewing the records of 5,000 patients who underwent oral cholecystography at the New York Hospital between January 1970 and October 1972. In most cases, the patient was given two Telepaque (iopanoic acid) tablets (1 g) every 15 min for 45 min following a fat-free meal on the evening before examination. In the event of nonopacification, the examination was repeated within two days. Of the 5,000 patients reviewed, 75% showed adequate opacification on the first examination. On repeat study in the remaining 25%, opacification was adequate in 827 cases (67%) and inadequate in 413 cases. Among those whose gallbladder was opacified on the second examination, 20% showed evidence of disease (cholelithiasis in 152 cases, adenomyoma in four cases, cholesterosis in three cases, and Rokitansky-Aschoff sinuses in one case). Among the 413 patients whose gallbladders remained nonopacified on the second examination, nonopacification was due to extrinsic causes in 68 (advanced liver disease in 44 cases, previous cholecystectomy in 17 cases, obstruction of the pyloric canal in five cases, cholecystojejunostomy in one case, and failure to administer the Telepaque on the preceding evening in one case). Among the 345 patients in whom nonopacification was not due to extrinsic causes, 152 underwent surgery. All 152 patients showed evidence of disease (chronic cholecystitis with calculi in 134; chronic cholecystitis with acute exacerbation in seven; chronic cholecystitis without calculi in six; cancer of the gallbladder with calculi in three; subacute cholecystitis with calculi in one; and cholangiocarcinoma in one). The results indicate that once all extrinsic causes have been ruled out, nonopacification of the gallbladder on two consecutive examinations is indicative of obstructive gallbladder disease or chronic cholecystitis. I.v. cholangiography will produce filling of the gallbladder in the latter but not in the former condition.

9222 LAYERING OF CONTRAST MATERIAL IN ORAL CHOLECYSTOGRAPHY. (*E.*) Bryk, D.; Moadel, E. (Jewish Hosp. and Medical Center, 555 Prospect Place, Brooklyn, N. Y. 11238). *Am. J. Dig. Dis.* 20 (8):727-734, 1975.

To evaluate the layering of bile in the gallbladder seen during p.o. cholecystography, recumbent roentgenograms and a series of erect spot roentgenograms of the gallbladder were taken before and after a commercial fatty meal in 50 patients with no significant clinical evidence of biliary disease. There was considerable variation the contraction of the gallbladder secondary to the fatty meal and in refilling two hr after the fatty meal; however 82% of the cases contracted 20% or more at 30 min and 78% showed refilling of 11% or greater. Layering was related to good contraction and good refilling; of the 30 cases in which layering occurred, 25 showed contraction above 39% and refilling of 11 to 150%, while only five of the 20 patients in which layering did not occur showed a similar degree of contraction and refilling. These differences were highly significant. In three patients, layering occurred before administration of the fatty meal and the contraction produced by the meal eliminated the layering. The results indicate that the layering phenomenon is a manifestation of a normally functioning gallbladder and that it is due to the slow mixing of fresh bile with retained opacified bile. Failure to show layering under these circumstances is presumably due to differences in miscibility of the bile, bile concentration, and patient movement, which would tend to encourage mixing.

9223 PIGMENT VS CHOLESTEROL CHOLELITHIASIS: CLINICAL AND EPIDEMIOLOGICAL ASPECTS. (*E.*) Trotman, B. W.; Soloway, R. D. (Hosp. Univ. Pennyslvania, 3400 Spruce St., Philadelphia, Pa. 19104). *Am. J. Dig. Dis.* 20(8):735-740, 1975.

The influence of clinical and biochemical variations on the type of stone found in patients undergoing cholecystectomy for symptomatic cholelithiasis was studied prospectively in 92 such patients and in a control population of noncholecystectomized patients. In 25 of the cholecystectomized patients, the stone specimens were classified as pigment stones and in 67 they were classified as cholesterol stones. The incidence of cholesterol stones peaked at the fourth decade of life, whereas the incidence of pigment stones peaked in the eighth decade. Sex, but not race, was a significant determinant of stone type: pigment stones occurred with equal frequency in men and women, but cholesterol stones occurred twice as frequently in women as in men. Patients with cholesterol stones weighed significantly more than those with pigment stones whether expressed as actual or ideal weight. The incidences of diabetes, thyroid disease, and alcoholism were similar in the pigment and cholesterol stone groups, as were the hemoglobin, bilirubin, and blood glucose values. Among the 50 black patients with gallstones, heterozygous hemoglobinopathy did not influence stone type. The data confirm that sex (female) and obesity are strongly correlated with cholesterol stone formation, presumably due to excess biliary cholesterol which results in cholecystectomy at a mean age of 43 yr.

9224 CLINICAL COMPARISON OF TYROPANOATE SODIUM, IPODATE SODIUM, AND IOPANOIC ACID. (*E.*) Russell, J. G.; Frederick, P. R. (Latter-Day Saints Hosp., Salt Lake City, Utah). *Radiology* 112(2):519-523, 1974.

The density of gallbladder images and the frequency of side effects, stones, repeat studies, and common duct opacification were compared following the administration of tyropanoate sodium (Bilopaque, 3 g), ipodate sodium (Oragrafin, 3 g), and iopanoic acid (Telepaque, 3 g) in a double-blind fashion to clinical patients requiring gallbladder examinations. A total of 853 examinations were performed. With iopanoic acid, the frequency of adequate opacification on the second study was significantly higher than with either of the other two agents. Also, the frequency of double absent shadows was significantly less with iopanoic acid than with the other agents. The frequency of indeterminate repeat studies was significantly greater with ipodate sodium than with the other agents. The frequencies of abnormal studies with the three media were not significantly different. There were no false positive results, but there were five false negatives; the false negative rate with tyropanoate sodium was 7% and with the other media was 3%. The three agents did not differ significantly with respect to accuracy of radiologic diagnosis. Iopanoic acid yielded the highest frequency of stone demonstration and side effects (diarrhea and dysuria). The choice of contrast medium for oral cholecystography should be decided on the basis of personal preference regarding the density of gallbladder opacification desired and the significance attached to the higher frequency of diarrhea (19%) which occurs with iopanoic acid.

9225 CLINICAL TRIAL OF BILOPAQUE (TYROPANOATE SODIUM) ORAL CHOLECYSTOGRAPHY: EVALUATION OF TIME FOR THE OPTIMAL AND PEAK OPACIFICATION OF THE GALLBLADDER. (*E.*) Han, S. Y.; Witten, D. M. (Univ. Alabama Sch. Medicine, Birmingham, Ala.). *Radiology* 112(3):529-530, 1974.

The time of peak opacification of the gallbladder, the incidence of side effects, and the amount of residual contrast material in the bowel were evaluated in 89 patients to whom tyropanoate sodium (3 mg) was administered 4 to 12 hr prior to cholecystography. The examination was discontinued prior to completion in two patients, and in nine others the gallbladder was not opacified as a result of disease. The gallbladder was opacified in the remaining 78 patients. In 61 of these (78%), it was opacified on the four-hr film; the amount of opacification was graded as poor in 11 cases, fair in 20, good in 25, and excellent in 5. Peak opacification was observed at four hr in 19 patients, six hr in 16, eight hr in 26, ten hr in 14, and 12 hr in three. Residual contrast material appeared in the bowel in 18 patients; in four cases, dense and coarse particles were seen in the small bowel and ascending colon, whereas in the remaining 14 it appeared as a homogeneous and fluffy density in the small bowel or ascending colon. Residual contrast material in the bowel did not interfere with interpretation of the film in any patient. Fair to good opacification of the common duct was obtained in 13 patients (16%), and three patients suffered mild side effects (nausea in two and diarrhea in one). The results indicate that the optimal time for radiography in tyropanoate sodium cholecystography is from 4 to 8 hr after ingestion of the contrast agent; if visualization is poor at 10 or 12 hr, radiography is warranted.

9226 TIME OF OPTIMAL GALLBLADDER OPACIFICATION WITH BILOPAQUE (TYROPANOATE SODIUM).

(E.) Oliphant, M.; Whalen, J. P.; Evans, J. A. (New York Hosp.-Cornell Univ. Center, New York, N.Y.). *Radiology* 112(3):531-532, 1974.

The clinical side effects of tyropanoate sodium and the time of earliest maximum visualization of the human gallbladder after ingestion of this agent (3.0 g) were studied in 54 patients. The patients were placed on a fat-free diet beginning 12 hr prior to the start of the study and radiographs were obtained at two-hr intervals from 2 to 12 hr after ingestion of the contrast material and again at 24 hr. Four patients were eliminated because of nonvisualization on the first dose or interference due to gallstones. Of the initial 12 cases, maximum visualization occurred in 11 prior to 12 hr and at 12 hr in the remaining case. In the remaining 38 patients, maximum visualization was obtained within ten hr. Although 8% of the patients showed some visualization at two hr, none showed maximum visualization at this time. Forty-three patients (86%) reached maximum visualization (+3 or + 4) at 6 or 8 hr; 25 of these patients had a grade of +4. Once a maximum visualization was attained, the optimal density remained fairly constant with only minor fluctuations. Thirty-five patients (70%) obtained maximum visual and densitometric peaks at 6 or 8 hr. By eight hr, optimal visualization was observed in 82% of the patients; at ten hr, 98% had reached optimal visualization. Five patients had mild nausea, which was delayed in one case, and one patient complained of mild abdominal cramps. It is concluded that the time necessary for optimal visualization of the gallbladder is significantly less with tyropanoate sodium than with iopanoic acid.

9227 DOUBLE-BLIND STUDY OF FOUR ORAL CHOLECYSTOGRAPHIC PREPARATIONS.

(E.) Parks, R. E. (Broward Gen. Med. Cent., Fort Lauderdale, Fla.). *Radiology* 112(2):525-528, 1974.

The efficacy and side-effects of iocetamic acid (Cholebrine, 3.0 or 4.5 g administered p.o. in tablet form), tyropanoate sodium (Bilopaque, 3.0 g administered p.o. in the form of capsules), and iopanoic acid (Telepaque, 3.0 g administered p.o. in tablet form) were studied in a double-blind trial in 800 adults requiring cholecystography. All radiographic examinations were reviewed by 2 radiologists who rated the opacity of the gallbladder examination, the visualization of the cystic and common ducts, and residual contrast material in the intestinal tract. These 4 drug dosages did not differ appreciably in the level of their opacity or the gallbladder opacity they produced. Similarly, no significant differences were found in terms of the proportion of patients with good or excellent opacification or in the incidence of repeat examinations for poor visualization. The cystic duct and common bile duct were faintly visualized in only 2 of 938 examinations. Although residual contrast material in the gastrointestinal tract was present in 75% of the examinations, it is not considered significant because residual barium was also present in most patients from a barium enema administered prior to cholecystography. The proportion of patients reporting cramps which were probably drug-related was significantly lower in the 3 g iocetamic acid group than in the iopanoic acid and tyropanoate sodium groups, and the proportion of patients reporting diarrhea was significantly lower in the 3 g iocetamic acid group than in the iopanoic acid group. The data suggest that 3 g iocetamic acid is preferable to the other preparations tested.

9228 ULTRASONIC B-MODE EXAMINATION OF THE GALLBLADDER.

(E.) Doust, B. D.; Maklad, N. F. (Wayne County General Hosp., Eloise, Mich.). *Radiology* 110(3):643-647, 1974.

Ultrasonic B-mode examinations were performed in 50 patients with known gallbladder size, shape and pathology in order to define the accuracy, limitations, and usage of cholecystosonagraphy in the management of gallbladder disease. The patients were fasted and scanning was performed at intervals of 0.5 cm in the longitudinal axis. In 33 patients, the gallbladders were demonstrated without difficulty, and in 13 others the gallbladders were identified only with much greater difficulty; in the remaining four patients, the gallbladder could not be identified. The normal gallbladder appeared in the transverse scan as a round or oval echo-free area located posteromedially to the right lobe of the liver; in sagittal scans, it appeared as a pear-shaped sonolucent structure on the undersurface of the liver. Difficulty in demonstrating this organ was encountered whenever: it was small, high under the ribs, contained a multitude of small stones, or was sharply angulated; these difficulties were minimized by fasting. Of the 28 patients in whom the gallbladder was known to contain stones, the gallbladder was positively identified in 25 and stones were correctly identified in 21. Four of 22 patients in whom there were no stones were reported as having stones. Generally, the stones appeared on the cholecystosonograms as single or multiple linear echoes located adjacent to the posterior wall of the gallbladder. False positive diagnoses of gallstones were largely preventable if, after delineation of the limits of the gallbladder, the gain was reduced to a level just high enough to allow differentiation of the liver from the gallbladder. Suspension of respiration also helped in eliminating false positives. It is concluded that cholecystosonography should be attempted in cases where conventional radiographic examinations of the gallbladder fail to provide diagnostic information. In patients in whom the gallbladder can be identified, an overall diagnostic accuracy of 80% can be expected in the diagnosis of gallstones.

9229 ^{99m}TC-TETRACYCLINE AS A KIDNEY AND GALLBLADDER IMAGING AGENT.

(E.) Fliegel, C. P.; Dewanjee, M. K.; Holman, L. B.; Davis, M. A.; Treves, S. (Harvard Medical Sch., Boston, Mass.). *Radiology* 110(2):407-412, 1974.

To evaluate ^{99m}Tc-tetracycline as a potential imaging agent in the kidney and gallbladder, the toxicity, biological distribution, and kinetics of this radiopharmaceutical were studied in male mongrel and beagle dogs and in New Zealand rabbits. The animals were anesthetized and given an i.v. dose (5-50 μCi) of the agent. Blood and urine samples were obtained using indwelling catheters, and the animals were sacrificed 1-24 hr after injection. The intrarenal and gallbladder distribution of ^{99m}Tc-tetracycline was studied by autoradiography; i.v. cholecystokinin (2 U/kg) was used to stimulate contraction of the gallbladder during imaging of this organ. In the toxicity studies, rabbits were injected with a single i.v. dose (40 mg) of the compound or were given a total of 200 mg in ten doses over a two-wk period. The blood disappearance rate of the radiopharmaceutical showed a fast component with a $T_{1/2}$ of 22 min (85% of the injected dose) in the rabbits and 35 min (52% of the injected dose) in the dogs, and a slow component with a $T_{1/2}$ of ten hr (15% of the injected dose) in the rabbits and 11 hr (27% of the injected dose) in the dogs. The rate of urinary excretion was 28.5% of the injected activity at five hr in the dogs and 65% at four hr in the rabbits. On a per gram basis, the kidney uptake in the rabbit at two hr was ten times higher than that of the blood; the liver concentration was similar to that in the blood; and the gallbladder concentration was four-fold greater than that in the blood. The activity recovered from the small intestine and from the skeleton was low. Uptake by the renal cortex was 15 times higher than the uptake by the renal medulla, and the urinary activity was three times higher than the renal cortical activity. Most of the Tc was still bound to the tetracycline. Similar results were obtained in the dogs. Excellent static and dynamic images of the kidneys and gallbladder were obtained in both species. Neither the acute nor the subacute toxicity studies revealed pathological changes related to the radiopharmaceutical. These results encourage clinical trials of ^{99m}Tc-tetracycline as a renal and gallbladder imaging agent in humans.

9230 THE LOW-FAT MEAL IN GALLBLADDER EXAMINATIONS.

(E.) Mauthe, H. (Saint Agnes Hosp., Fond du Lac, Wisc.). *Radiology* 112(1):5-7, 1974.

The effects of fatty food ingestion on x-ray visualization of the gallbladder were determined in radiographic examinations. Some of the patients (479) had received a low-fat meal or no food at all on the preceeding evening, and 584 patients had consumed a "regular diet" hospital meal or their own regular meal at home. Each patient was given one Telepaque pill per 20 lb of body weight within 2-3 hr after the evening meal. In addition, 64% of the patients received three Dulcolax tablets at bedtime, and some patients were given fat-free meals in the morning prior to examination. The rate of satisfactory visualization on the first examination was 77% for the "low-fat meal" group and 81.4% for the "regular diet" group. On repeat examination, 6.2% of the gallbladders in the regular diet group and 10.9% of those in the low-fat group failed to show up. When all patients whose gallbladders could not be seen on either examination were eliminated from consideration, the results showed that 88.3% of the patients on a "regular diet" could be expected to show adequate results on the first examination; if a low-fat meal is given on the previous evening, a visualization rate of 86.6% can be expected. Dulcolax did not interfere with visualization and may even have enhanced it. The data indicate that there is no merit in prescribing a special low-fat meal on the evening before gallbladder examination.

9231 ELEVATED CARCINOEMBRYONIC ANTIGEN LEVELS AND BILIARY TRACT OBSTRUCTION.

(E.) Lurie, B. B.; Loewenstein, M. S.; Zamcheck, N. (Boston City Hosp., Boston, Mass. 02118). *JAMA* 233(4):326-330, 1975.

Circulating carcinoembryonic antigen (CEA) levels and their relation to liver function test values were studied in 29 jaundiced patients (20 men, 9 women) with benign extrahepatic biliary tract obstruction and inflammation. Serial liver function tests included SGOT, serum bilirubin and alkaline phosphatase level assay. CEA levels were greater than 2.5 ng/ml for 15 (52%) patients: ten patients had values between 2.5 and 5.0 ng/ml and five patients had values between 5.0 and 10.0 ng/ml. Elevated CEA levels were associated more frequently with common bile duct stones only (5 of 7 patients) than with gallbladder stones alone (3 of 9 patients); this difference was not statistically significant. The highest CEA levels were found in two patients with liver abscesses; these levels returned to normal in seven of ten patients following relief of obstruction, and increased in two patients who had progressive inflammation. Serum alkaline phosphatase and bilirubin levels were higher in the patients with elevated CEA levels (563 *vs* 254 IU, resp., and 7.2 *vs* 3.7 mg/100 ml, resp.) than other patients. Serum alkaline phosphatase levels showed a positive correlation with CEA levels. It is concluded that patients with obstructive jaundice and elevated CEA levels do not necessarily have cancer. Benign extrahepatic biliary tract obstruction and inflammation can cause elevated CEA levels which return to normal when these factors are eliminated.

9232 CALCIUM IN LIMY BILE AND GALLSTONES.

(Ger.) Wosiewitz, U.; Wolpers, C. (Institut Medizinische Physik, Universitat, D-4400 Munster, Hufferstr. 68, Germany). *Leber Magen Darm* 5(1):3-12, 1975.

Comparisons were made of radiological findings before and after surgery on gallstones from 542 patients. Patients with negative cholecystograms, with the "Mercedes" sign (gas-containing gallstones), and porcelain gallbladder were not included. Of the 542 patients studied, 32.1% had solitary and 56.4%, multiple cholesterol gallstones; 11.5% had pigment stones. No Ca was found in 63.8% of the gallstones preoperatively or in 51.2% postoperatively. Postoperative X-ray examination showed that Ca-opaque structures were least common (39.9%) in multiple cholesterol gallstones and were most common (79.1%) in pigment stones; these structures were present in 53.2% of solitary cholesterol stones. X-ray diffraction analysis, IR spectroscopy, and X-ray fluorescence analysis were used to examine Ca-containing stones from 26 patients, limy bile from three, and Ca-free stones from six. Samples of limy bile contained $CaCO_3$ present as vaterite and/or calcite (microliths) when fresh, and as aragonite (rod-shaped structures) when stored for long periods. Stones with Ca in the center always consisted of calcium bilirubinate and generally contained small amounts of Ca. In solitary or multiple cholesterol stones, large amounts of $CaCO_3$ (82%) were found as calcite, aragonite, or vaterite in ring- or saucer-shaped structures; vaterite was the most common form encountered (62%). $CaCO_3$ was present in a radial pattern in some solitary cholesterol stones and in one patient with multiple colesterol stones. In two patients who had solitary cholesterol stones wedged in the cystic duct, Ca deposits were present on only one side of the stones as deposits of aragonite with a pronounced crystalline texture. In three faceted stones, Ca was present in thin, rosette-like structures as the palmitate. *In vitro* experiments demonstrated that porous stones of cholesterol and Ca salts and stones with partially formed scales of $CaCO_3$ dissolved readily in diethyl ether, leaving behind skeletons or a fine, powdery residue.

9233 KINETICS AND POOL SIZE OF CHENODEOXYCHOLIC ACID IN CHOLESTEROL GALLSTONE PATIENTS.

(E.) Pedersen, L.; Arnfred, T. (Depts. Medicine and Clinical Chemistry, Aalborg Sygehus Nord, Aalborg, Denmark). *Scand. J. Gastroenterol.* 10(5):557-560, 1975.

The kinetics, half-life, pool size, and daily production rate of chenodeoxycholic acid (CDCA) were examined by isotope dilution in untreated gallstone patients and compared to healthy controls in order to determine the specific role of CDCA in the pathogenesis of gallstones. Seven patients with radiolucent gallstones in functioning gallbladders and nine healthy controls were injected i.v. with 10 µCi of 24-^{14}C-CDCA. Bile was recovered by duodenal intubation. The CDCA percentage of total bile acids (TBA) and the TBA pool size were calculated. The pool size and daily production rate of CDCA were decreased in the gallstone patients; the results were not significant. The CDCA half-life was similar in both groups. The CDCA percentage of TBA was significantly higher in the patients (49 ± 10%) than in the controls (39 ± 7%). The TBA pool size was significantly reduced in gallstone patients (1073 ± 391 mg *vs* 1822 ± 511 mg for the controls). It was concluded that the CDCA and cholic acid metabolic pathways are similar in gallstone patients and that gallstone formation is not due to specific alterations in CDCA metabolism. The significance of increased CDCA percentage in bile was also discussed. It was suggested that a relative increase in the bile content of dihydroxy bile acids may lead to a reduced cholesterol holding capacity of bile, thus favoring the formation of gallstones.

9234 THE EFFECT OF CHENODEOXYCHOLIC ACID FEEDING ON BILE ACID KINETICS AND FECAL NEUTRAL STEROID EXCRETION IN PATIENTS WITH HYPERLIPOPROTEINEMIA TYPES II AND IV.

(E.) Kallner, M. (Dept. Medicine, Serafimerlasarettet, Stockholm, Sweden). *J. Lab. Clin. Med.* 86(4):595-604, 1975.

The turnover of 24-^{14}C-cholic acid and ^{3}H-chenodeoxycholic acid and the excretion of cholesterol fecal neutral steriods were studied before and during p.o. administration of chenodeoxycholic acid to patients with hyperlipoproteinemia. Chenodeoxycholic acid (0.8-1.0 g/day) was administered to six patients with type II and to seven patients with type IV lipoprotein pattern. During treatment the chenodeoxycholic acid pool size increased in all subjects (not studied in one type IV patient), and in type II patients was associated with a decrease in the cholic acid pool size (868 ± 141 mg to 213 ± 51 mg) and synthesis rate (204 ± 36 mg/day to 54 ± 20 mg/day). The cholic acid pool size decreased in six of the seven patients with type IV hyperlipoproteinemia; all subjects showed a decrease in cholic acid synthesis (607 ± 155 mg/day to 202 ± 44 mg/day). The difference encountered in cholic acid synthesis suggests that the feedback regulation of cholic acid formation might be hypersensitive in type II and/or insensitive in type IV. Chenodeoxycholic acid feeding had no consistent effect on the fecal excretion of cholesterol, coprostanol, and coprostanone.

9235 DISSOLVING GALLSTONES IN VIVO: THE EFFECT OF CHENODEOXYCHOLIC ACID ON GALLSTONES, THE LITHOGENICITY OF BILE, AND SERUM LIPIDS IN MAN.

(Ger.) Fromm, H.; Eschler, A.; Tollner, D.; Canzler, H.; Schmidt, F. W. (Medizinische Hochschule, 3 Hannover-Kleefeld, Karl-Wiechert-Allee 9, Germany). *Dtsch. Med. Wochenschr.* 100(32):1619-1624, 1975.

Chenodeoxycholic acid (CDCA; 20 mg/kg/day) was administered for an average of 15 months to 14 patients (8 women and 6 men, aged 32-76 yr; mean age 52 yr) with radiologically diagnosed cholelithiasis who had refused surgery. All but one of the patients had multiple nonradiolucent gallstones; the remaining patient had a solitary calcified stone. In two patients, the gallstones dissolved completely after 12 and 15 months of therapy, resp., and the size of the stones decreased in four others. No changes occurred in the remaining eight patients. One patient developed a perforated gallbladder during therapy. Upper abdominal discomfort disappeared during therapy in two patients and improved in nine. In general, CDCA was well tolerated. The only side effect was mild intermittent diarrhea which occurred in five patients. Bile was supersaturated with cholesterol in five of seven patients tested; the bile lipid composition normalized during CDCA therapy in all five patients. Serum triglyceride levels decreased during administration of CDCA in 10 of 11 patients tested, with the greatest decreases occurring in five patients with hypertriglyceridemia. This decrease in serum triglyceride levels was associated with a decrease in the pre-β-lipoprotein and chylomicron fractions. No significant change occurred in serum cholesterol levels.

9236 HEPATIC CHOLESTEROL METABOLISM IN PATIENTS WITH GALLSTONES. *(E.)*

Salen, G.; Nicolau, G.; Shefer, S.; Mosbach, E. H. (East Orange VA Hosp., N. J.). *Gastroenterology* 69(3):676-684, 1975.

By determining the hepatic activities of 3-hydroxy-3-methylglutaryl-CoA (HMG-CoA) reductase and cholesterol 7α-hydroxylase, the relative rates of cholesterol and bile acid synthesis were estimated in 12 patients with cholesterol gallstones and 5 patients with extrahepatic biliary obstruction caused by carcinomas of the head of the pancreas or pancreatic pseudocysts. Similar measurements were performed on 6 patients with chronic duodenal ulcer and 3 patients in whom no diagnosis could be established; these controls had no evidence of lipid or liver abnormalities. In each case, enzyme activity and liver total cholesterol and microsomal free cholesterol determinations were performed on hepatic biopsy specimens. The mean hepatic HMG-CoA reductase activity was 27% greater in patients with gallstones and 75% lower in those with extrahepatic biliary obstruction than in the controls. These findings were not reflected in the plasma cholesterol levels, which were highest in the subjects with biliary obstruction. The activity of hepatic cholesterol 7α-hydroxylase was only 1/2 of control values in patients with gallstones and was also severely depressed in patients with extrahepatic biliary obstruction. The hepatic cholesterol concentration was 56% higher in the gallstone patients than in the controls. It was also elevated in 2 of the patients with extrahepatic biliary obstruction, but there was a wide variation in hepatic cholesterol concentration in this group. The cholesterol concentrations in the isolated microsomes of the gallstone and control groups were similar. The data suggest that the development of gallstones is related both to increased cholesterol synthesis and to decreased bile acid formation, whereas cholesterol accumulates in biliary obstruction because of defective removal.

9237 CHOLESTATIC JAUNDICE FOLLOWING INGESTION OF THE LAXATIVE, NORMOLAXOL. *(Ger.)*

Trulzsch, D.; Klinge, O.; Zilly, W.; Richter, E. (Medizinische Klinik, Universitat Wurzburg, 87 Wurzburg, Josef-Schneider-Strasse 2, Germany). *Med. Klin.* 70(17):771-774, 1975.

Case reports are presented for two women, aged 28 and 34 yr, who developed cholestatic jaundice after taking Normolaxol (4,4'[2-quinolylmethylene]diphenol hydrochloride) for 23 and 14 days, resp. This laxative is structurally similar to bisacodyl and is related to oxyphenisatin. The first patient, who had been taking antacids for chronic gastritis for about three yr, needed laxatives to correct the resulting constipation. In addition to Normolaxol, she had been taking an oral contraceptive, Stediril-D, for six wk before hospitalization with jaundice, anorexia, and pruritis. The second patient, who apparently had viral hepatitis as a child, presented with nausea, vomiting, a fever of 40 C, and jaundice. In both cases, viral hepatitis was ruled out by liver biopsies which showed: edema of the hepatic triads; swelling of the hepatic epithelium in the inner parts of the lobules; concentration of basophilic ergastoplasm at the peribiliary pole of the cells; intracellular drops of bile and bile cylinders; and some reparative mitotic figures. No radiological evidence of extrahepatic biliary obstruction was found in either patient. The cause of this cholestatic jaundice was confirmed to be Normolaxol in the first patient since she developed a recurrence of jaundice two days after administration of 2 teaspoons of the laxative. Although the second patient received no drugs after hospitalization, serum bilirubin and transaminase values took five wk to return to normal.

9238 INFLUENCE OF PHENOBARBITAL ON BILE COMPOSITION IN EPILEPTIC PATIENTS. *(E.)*

Capron, J. P.; Dumont, M.; Dairou, R.; Erlinger, S. (Hopital Beaujon, 100, boulevard du General Leclerc, 92100 Clichy, France). *Biomedicine* 23(5):176-179, 1975.

The effect of phenobarbital on bile composition was studied in 13 epileptic patients (5 women and 8 men) who had been taking the drug (0.05-0.3 g/day) for an average of 11 yr. Fourteen subjects without liver disease, who were not receiving any drugs, served as controls. A single lumen duodenal tube was placed in the second part of the duodenum in the fasted subjects, and cholecystokinin (40 Ivy units, i.v.) was administered. The gallbladder bile was collected by aspiration and its bile salt, phospholipid, and cholesterol concentrations were determined. There was no significant difference in relative bile composition between the phenobarbital-treated subjects and controls, and there was no apparent relation between the dose and duration of drug treatment and the relative bile composition. The bile acid plus phospholipid:cholesterol ratio also did not differ between the two groups. Four of the phenobarbital-treated subjects and eight of the control had saturated or supersaturated bile. The results indicate that phenobarbital treatment does not produce detectable modifications in bile composition. They also give no indication that phenobarbital may be useful in the treatment of cholesterol gallstones.

9239 ON THE PHYSICIAN'S TACTICS IN CHOLECYSTITIS. *(Rus.)*

Tereshkov, T. A. (Dept. Surgery, Labin Central Regional Hosp., USSR). *Khirurgiia* (1):19-22, 1975.

9240 PECULIARITIES OF PATHOGENESIS OF CHOLELYTHIASIS [SIC] AND ACUTE CHOLECYSTITIS IN ELDERLY AND AGED PATIENTS. *(Rus.)* Belsky, A. V.; Arkhangelsky, A. V.; Safronov, A. V. (Clinic General Surgery, Saratov Medical Inst., USSR). *Khirurgiia* (1):15-19, 1975.

9241 POSTOPERATIVE MORTALITY IN ACUTE CHOLECYSTITIS. *(Rus.)* Rogachev, G. I. (Faculty Hosp. Clinic Surgery Pediatric Stomatological Faculties, N. I. Pirogov Odessa Medical Inst., USSR). *Khirurgiia* (1):22-26, 1975.

9242 CARCINOMA IN SITU OF THE GALLBLADDER DETECTED BY THE SERIAL SECTION: REPORT OF TWO CASES. *(Jpn.)* Muto, Y.; Uchiyama, M.; Waki, S.; Sameshima, Y.; Ishigaki, J.; Murohisa, B.; Okamoto, K. (Depts. Surgery and Pathology, Hamamatsu Irye Center, Japan). *Gan No Rinsho* 21(5):354-359, 1975.

9243 HEMOBILIA. *(Cz.)* Tesar, O. (Pediatr. Faculty, Charles Univ., Prague-Motol, Czechoslovakia). *Cesk. Gastroenterol. Vyz.* 29(3):137-143, 1975.

9244 DIAGNOSIS AND SURGERY FOR OBSTRUCTIVE JAUNDICE. *(Rus.)* Kravchuk, A. N. (Faculty Hosp. Clinic Surgery Pediatric Stomatological Faculties, N. I. Pirogov Odessa Medical Inst., USSR) *Khirurgiia* (1):26-31, 1975.

9245 SCLEROSING CHOLANGITIS IN THE DIFFERENTIAL DIAGNOSIS OF JAUNDICE. *(Rus.)* Tatianko, N. V.; Matiashin, I. M.; Gusovsky, Y. M.; Kovalchuk, V. E. (Clinic Hepatitis, Kiev Scientific Res. Inst. Infectious Diseases, Kiev, USSR). *Vrach. Delo* (4): 126-132, 1975.

9246 SYMPATHICO-ADRENAL FUNCTION IN CHRONIC CHOLECYSTITIS AND MECHANICAL JAUNDICE. *(Rus.)* Kalchenko, I. I.; Lys, P. V.; Vasilchuk, Y. M. (Dept. Surgery, Kiev Inst. Postgraduate Training Physicians, Kiev, USSR). *Klin. Khir.* (1):12-18, 1975.

9247 RADIOISOTOPE EXAMINATION OF THE LIVER AND THE BILIARY TRACT AFTER CHOLECYSTECTOMY. *(Rus.)* Kasatkin, Y. N.; Rozanov, I. B.; Purizhansky, I. I.; Yakushin, V. I.; Khromenkov, V. I.; Sidorchuk, I. I. (Clinic Medical Radiology, TsIUv, Moscow, USSR). *Khirurgiia* (1):40-42, 1975.

9248 RESULTS OF SURGICAL MANAGMENT OF CHOLECYSTITIS IN THE AGED AND MIDDLE-AGED. *(Rus.)* Rodkin, S. A.; Surzhenko, I. A.; Gorkhover, V. I. (Faculty Clinic Surgery, Tyumen Medical Inst., USSR). *Khirurgiia* (1):11-15, 1975.

9249 DIRECT MANOMETRIC STUDY OF THE SPHINCTER OF ODDI IN MAN. A NEW METHOD [abstract]. *(E.)* Meckeler, K. J. H.; Borrow, M. (Somerset Hosp., Somerville, N. J.). *Gastroenterology* 68(4): 1038, 1975.

9250 EFFECT OF CHENODEOXYCHOLIC ACID ON IMMUNOREACTIVE SERUM LITHOCHOLATE IN GALLSTONE PATIENTS [abstract]. *(E.)* Allan, R. N.; Carter, J. A.; Yu, P. S.; Thistle, J. L.; Hofman, A. F. (Mayo Clin., Rochester, Minn.). *Gastroenterology* 68(4):913, 1975.

9251 EFFECT OF PHENOBARBITAL ON BILIARY LIPID METABOLISM IN MAN [abstract]. *(E.)* Ginsberg, R. L.; Garnick, M. B. (Phoenix Clinical Res. Section, NIAMDD, Phoenix, Arizona). *Gastroenterology* 68(4):899, 1975.

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See also, 8264, 8422, 8423, 8424, 8444, 8460, 8462, 8477, 8571, 8588, 8619, 8646, 8656, 8692, 8821, 8864, 8899, 8917, 8922, 8938, 8944, 8965, 8968, 9023, 9034, 9354, 9370.

GENERAL

9308 GASTRIC pH AND MICROFLORA OF NORMAL AND DIARRHOEIC INFANTS. *(E.)* Maffei, H. V. L.; Nobrega, F. J. (Faculty Medical Biological Sciences, Botucatu, Sao Paulo, Brazil). *Gut* 16(9):719-726, 1975.

The microflora and pH of gastric contents were determined in four groups of 14 infants (aged 1-12 months): breast-fed normal controls, bottle-fed normal controls, well-nourished infants with acute diarrhea; and infants with chronic diarrhea and protein-calorie malnutrition. Twelve infants in the fourth group were reevaluated after recovery from diarrhea and malnutrition. A bactericidal effect of pH below 2.5 was observed in all groups. Bottle-fed controls had low pH values (below 4.0) and low bacterial concentrations (below 4.00[$\log_{10}$]/ml), whereas infants with chronic diarrhea and protein-calorie malnutrition had high pH values and bacterial overgrowth, especially of Gram-negative bacilli (Enterobacteriaeceae and Pseudomoneaceae). After recovery, the only remaining alteration was the frequent isolation of yeast-like fungi, including *Candida albicans*, in low concentrations. Except for a greater frequency of isolation of yeast-like fungi compared with controls, infants with acute diarrhea presented no alterations; this indicated that pH alterations and Gram-negative bacilli overgrowth occurred during the evolution of the disease to the chronic state. Breast-fed normal infants had pH concentrations similar to those of the chronic diarrhea group but without Gram-negative bacilli overgrowth, suggesting that factors other than pH regulate bacterial overgrowth in the gastric contents of infants with chronic diarrhea.

9309 THE AGGLUTINATING ANTIBODY RESPONSE IN THE DUODENUM IN INFANTS WITH ENTEROPATHIC E. coli GASTROENTERITIS. *(E.)* McNeish, A. S.; Evans, N.; Gaze, H.; Rogers, K. B. (Inst. Child Health, Univ. Birmingham, Francis Rd., Birmingham B16 8ET, England). *Gut* 16(9):727-731, 1975.

The agglutinating antibody responses in duodenal fluid and serum were measured serially in 15 infants (aged 5 weeks to 15 months) with enteropathogenic *Escherichia coli*. All infants presented with acute diarrhea and vomiting of one to five days duration. Duodenal fluid from each infant was incubated at 37 C for one hr with monospecific sheep antihuman immunoglobulin (Ig) G, IgA, and IgM antisera. The antisera were of known antigen-binding capacity; a reduction in bacterial agglutination titer of two dilutions or more in the supernatant indicated the presence of agglutinating antibody of the appropriate Ig class. Peak levels of duodenal agglutinins were recorded eight to 18 days after the onset of symptoms, and the titers fell within the next seven to 14 days. IgA antibodies were detected in all patients at some stage. IgM antibodies were detected early in the response in five patients and appeared to be the predominant antibodies in two. IgG antibodies were found in two patients. Eight children had agglutinating antibodies in their sera, but serum titers did not correlate with intestinal titers. No agglutinin response was detected in six children. Further studies are required to determine whether the differences in intestinal and serum responses are host-derived or whether they reflect different pathogenic properties of the infecting organism.

9310 MORPHOLOGICAL FEATURES IN A NEUTRAL LIPID STORAGE DISEASE. *(E.)* Slavin, G.; Wills, E. J.; Richmond, J. E.; Chanarin, I.; Andrews, T.; Stewart, G. (Northwick Park Hosp. and Clinical Res. Center, Harrow, Middlesex, England). *J. Clin. Pathol.* 28(9):701-710, 1975.

The morphological changes in a 22-yr-old Ugandan Asian woman with a generalized storage disease characterized by the intracellular deposition of neutral lipid are described. Biopsy specimens of bone marrow, jejunum, stomach, rectum, liver, endometrium, vastus lateralis muscle, and skin were examined by light microscopy, and specimens of bone marrow, stomach, rectum, skin, liver, and peripheral blood buffy coat were examined by electron microscopy. Lipid vacuolation was present in the sternal marrow granulocytes and monocytes, the columnar epithelial cells of the jejunal mucosa, the glandular cells from the body of the stomach, the epithelial cells of the rectal mucosa, the liver parenchymal cells, the stromal cells of the endometrial curettings, the vastus lateralis muscle, and the cells of the stratum basale of the skin. Foamy macrophages were observed in the jejunal and stomach specimens and the skin biopsy showed an ichthyosiform reaction which did not conform to any of the classical forms of ichthyosis. Lipid histochemistry indicated that the lipids present in the various tissues were neutral fat, largely triglyceride but with a very minor component of cholesteryl esters. The peripheral blood lymphocytes showed a normal female karyotype with no evidence of mosaicism. Electron microscopy confirmed the histological distribution of lipid and also demonstrated the presence of lipid droplets in the peripheral blood erythroblasts, reticulocytes, and occasional lymphocytes. In addition, lipid droplets were identified in the nuclei of some liver parenchymal cells, although they were not observed in any of the membrane-bound organelles. In the liver, lipid droplets were sometimes partially surrounded by mitochondria. Biochemical abnormalities included an elevation in the neutral triglyceride content of the peripheral blood granulocytes, a marked elevation of the B-peptide in low density lipoprotein, a reduction of the A-peptide in high density lipoprotein, increased incorporation of palmitate 1-^{14}C into triglyceride, and elevations in serum aspartate transaminase and creatine phosphokinase. The biochemical basis of the storage disorder in this patient is uncertain; the primary defect appeared to be intrinsic to the cell and may have involved either a defective cytoplasmic lipase or an impaired uptake and utilization of fatty acids by the mitochondria.

9311 ACUTE REVERSIBLE LUPUS VASCULITIS OF THE GASTROINTESTINAL TRACT. *(E.)* Shapeero, L. G.; Myers, A.; Oberkircher, P.E.; Miller, W. T. (Hosp. Univ. Pennsylvania, Philadelphia). *Radiology* 112(3): 569-574, 1974.

The records of 141 patients who had been diagnosed as having systemic lupus erythematosus during a 20 yr period were reviewed to identify those with gastrointestinal vasculitis. Abdominal symptoms which required medical therapy were present in 68 cases: 20 of the 68 had clinical signs of gastrointestinal arteritis, and 9 of these had radiographic findings consistent with some degree of ischemia. These included 4 with changes in the jejunal mucosa and 5 with radiographic evidence of gastric atony, duodenal stasis, or gastric pseudo-obstruction. The remaining 11 patients had normal radiographs or mild adynamic ileus. The most common symptoms in these 20 patients, in decreasing order of incidence, were anorexia, pain, postprandial fullness, nausea, and vomiting. In addition, 6 patients had diarrhea and 4 had evidence of gastrointestinal bleeding. The most frequently encountered clinical signs were abdominal tenderness with localized rebound and guarding; 65% of the patients were anemic and 95% had positive lupus erythematosus preparations. Most patients were afebrile and had normal WBC and normoactive bowel sounds. Since all of these patients improved with steroid therapy, and surgery proved unnecessary, pathological confirmation of vasculitis could not be obtained. Four typical case reports are presented. These findings suggest that gastrointestinal lupus vasculitis is more common than is generally recognized. While symptoms alone are not of great value in identifying patients with vasculitis, careful evaluation of abdominal plain radiographs or gastrointestinal series during a symptomatic period may be useful in establishing the diagnosis. Early recognition of gastrointestinal lupus vasculitis is important since the ischemia is often reversible with steroid therapy.

9312 LOWER ESOPHAGEAL SPHINCTER RESPONSES TO ENTERIC HORMONES IN TWO PATIENTS WITH ZOLLINGER-ELLISON SYNDROME. *(E.)* Wu, W. C.; Hogan, W. J.; Whalen, G. E.; Hoke, S. E.; Go, V. L. W.; Kalhoff, R. K. (Veterans Admin. Center, Wood [Milwaukee], Wisconsin). *Am. J. Dig. Dis.* 20(8):716-720, 1975.

This report describes two patients with proven Zollinger-Ellison Syndrome (ZES) in whom lower esophageal sphincter (LES) response to exogenous gastrin and other enteric hormones was determined. In case one (a 40-yr-old woman), peptic ulcer was demonstrated on roentgen examination. Selective celiac arteriography showed a "tumor blush" in the tail of pancreas, consistent with an islet cell neoplasm. Fasting serum gastrin level was 390 pg/ml. A total gastric resection and distal pancreatectomy were performed. Histologic examination of the resected pancreas confirmed an islet cell carcinoma. In case two (a 43-yr-old man with a 2-yr history of symptomatic peptic ulcer disease), vagotomy, antrectomy and gastrojejunostomy were performed for "intractable" ulcer pain. Several months later, abdominal pain recurred and a marginal ulcer was discovered at gastroscopy. Additional stomach was resected and a gastroduodenostomy and repeat vagotomy were performed. The patient did well postoperatively. Two months later, however, multiple serum gastrin determinations ranged between 300 and 900 pg/ml. Duodenoscopy revealed a duodenal wall tumor. At operation, the duodenal wall tumor (islet cell tumor) was resected and a total gastrectomy was performed. Serum gastrin was 62 pg/ml following the operation. Prior to their total gastrectomy, esophageal manometry was performed in both patients after an overnight fast. After localization of the LES by the conventional pull-through method, the three radial tips were secured within the sphincter at the position recording peak LES pressure. Glucagon was given i.v. in pulse doses of 1.0 and 10.0 μg, while pentagastrin was given as pulse doses of 2 and 4 μg/kg. An interval of 20 min separated each dose in both drug regimens. Secretin, 0.5 U/kg, i.v., was administered to the second patient. Serum for glucagon and gastrin determinations was drawn immediately prior to hormone injections and at 2, 5, 15 and 20 min. Glucagon and secretin, in dosages which decrease LES pressure in normal subjects only during LES stimulation by exogenous gastrin, caused a decrease in resting LES pressure in the ZES patients. This drop in LES tone occurred both during concomitant serum gastrin rise caused by secretin and during gastrin serum decline caused by glucagon. This finding suggests that the action of secretin on LES pressure may be independent of endogenous gastrin, while the glucagon effect on LES tone may be mediated through gastrin.

9313 ASCITES REINFUSION USING THE RHODIASCIT APPARATUS--CLINICAL EXPERIENCE AND COAGULATION ABNORMALITIES. *(E.)* Wilkinson, S. P.; Davidson, A. R.; Henderson, J.; Williams, R. (King's Coll. Hosp., London, S.E.5, England). *Postgrad. Med. J.* 51(598):583-587, 1975.

The Rhodiascit ascites reinfusion technique was used in the management of ascites in 20 patients (aged 23-65 yr) on 24 occasions. The procedure was used in these patients because of diuretic-resistant ascites with spontaneous functional renal failure (5 patients), diuretic-induced uremia (2), Budd-Chiari syndrome (2), to accelerate discharge from hospital for socioeconomic reasons (10), and for one patient with cirrhosis and non-functioning kidneys on maintenance hemodialysis who had recently developed ascites. The procedure was not of value in aiding patients with functional renal failure. Although ascites was partly relieved, all these patients died within two wk of recirculation. In the two cases of diuretic-induced uremia, a rapid improvement in renal function resulted from the reinfusion and encephalopathy also improved. Ascites was controlled afterward by lower doses of diuretics. The two patients with Budd-Chiari syndrome responded initially, but were later readmitted with reaccumulation of ascites and a deterioration in liver function. A second reinfusion was carried out in each case, but both patients died of hepatic failure within a week of the procedure. In ten patients who had good renal function, but marked ascites, conventional diurectic therapy would have taken two to three months to relieve the ascites, whereas use of the reinfusion procedure enabled all ten to be discharged within two wks of the reinfusion. In the one case of chronic renal failure, there was no other means of controlling ascites. He is being reinfused at three-month intervals. The uremia is well controlled on hemodialysis. Complications during the procedure were few. On six occasions body temperature rose by more than 1 C. A fall in plasma sodium concentration by more than 5 mEq/l was noted in four cases. It was noted that the plasma prothrombin time always became prolonged following six hr of the Rhodiascit procedure. Plasma fibrinogen concentrations also fell. Plasma levels of factors V, VII, and IX fell as well with mean reductions of 15%, 36%, and 19%, resp. The most likely cause of the abnormal blood coagulation tests was deposition of fibrin onto the filtration membrane. It is suggested that this procedure not be used in any patient with a recent history of bleeding or in patients with markedly abnormal tests of coagulation.

9314 A PROSPECTIVE COMPARATIVE TRIAL BETWEEN EARLY ENDOSCOPY AND RADIOLOGY IN ACUTE UPPER GASTROINTESTINAL HAEMORRHAGE. *(E.)* McGinn, F. P.; Guyer, P. B.; Wilken, B. J.; Steer, H. W. (Southampton Univ. Hosp., Southampton, England). *Gut* 16(9):707-713, 1975.

A prospective comparative trial is reported between the results of early endoscopy and barium meal examinations in 150 patients admitted with acute upper gastrointestinal hemorrhage. Of these patients, 138 underwent both investigations within 24 hr of admission. Emergency endoscopy accurately identified the source of hemorrhage in 86% of the patients; emergency radiology identified the source in 51%. All 19 patients bleeding from an esophageal source were identified endoscopically, whereas radiology detected the lesion in only three patients with varices. Gastric sources of hemorrhage were identified by endoscopy in 47 cases (92%) and by radiology in 23 cases (45%). Endoscopy identified a duodenal source of hemorrhage in 52 of 56 patients (93%) and radiology in 45 patients (80%). Misleading positive reports were given endoscopically in two patients and by barium meal in 11. Both misleading endoscopic reports were of hemorrhage from erosive gastritis in patients shown to have gastric ulceration on barium meal examination. Five of eight patients with radiological reports of duodenal ulceration had no evidence of active duodenal ulceration at endoscopy; three had other lesions that were causing hemorrhage. Three patients were reported radiologically to have a gastric ulcer, gastric carcinoma, and duodenal deformity, resp. In all three cases, endoscopy identified the source of the bleeding as Mallory-Weiss tears. The identification of the source of hemorrhage was possible in 126 patients (91%) by the use of both methods. While emergency endoscopy is superior to emergency barium meal examinations, the examinations are complementary and both should be used for patients with acute upper gastrointestinal hemorrhage.

9315 RADIOLOGICAL MANIFESTATION OF RADIATION-INDUCED INJURY TO THE NORMAL UPPER GASTROINTESTINAL TRACT. *(E.)* Goldstein, H. M.; Rogers, L. F.; Fletcher, G. H.; Dodd, G. D. (Univ. Texas System Cancer Center, Houston, Tex.). *Radiology* 117(1):135-140, 1975.

Radiation-induced injury to the esophagus, stomach and duodenum was studied in patients with bronchogenic, metastatic breast, cervical or testicular carcinomas, who had received high mediastinal or para-aortic lymph node irradiation to an average dose of 5,000 rads. Radiation esophagitis, characterized by dysphagia or substernal burning sensation, occurred in 30 patients following high dose (4,500-6,000 rads) mediastinal irradiation. Among these patients, the commonest radiologic finding was esophageal motor dysfunction. Morphological abnormalities such as stricture, angulation and ulceration occurred less frequently. Patients (52 men, 121 women) receiving 4,000 to 5,000 rads to the high para-aortic or right upper retroperitoneal area over a period of five wk usually developed radiation-induced gastroduodenitis, with or without frank ulceration. Radiation injury of the duodenum was most apparent in the second portion and varied from large ulcerations to smooth strictures; diffuse thickening of the mucosal pattern was also encountered. No significant healing occurred over an eight month period despite intensive therapy. When treatment was administered in a split course, as in testicular carcinoma, radiation injury to the upper gastrointestinal tract occurred less frequently. It is concluded that factors important in the pathogensis of radiation gastroduodenitis are related to dose-time relation of irradiation as well as individual susceptibility. Pertinent clinical features, pathogenesis, and pathological correlations are also discussed.

9316 GASTROINTESTINAL COMPLICATIONS FOLLOWING RENAL TRANSPLANTATION. *(E.)* Julien, P. J.; Goldberg, H. I.; Margulis, A. R.; Belzer, F. O. (Univ. California Sch. Medicine, San Francisco, Calif.). *Radiology* 117(1):37-44, 1975.

Gastrointestinal complications developing in 29 (6%) of 510 patients following renal transplantation are described. Special attention was paid to the time of onset of the complications, the type of immunosuppressive therapy, clinical and radiological findings and diagnosis. Of these patients, 13 (45%) died as a result of complications. Gastrointestinal bleeding, usually considered the most common complication, was observed in only seven cases. Other complications include the following: upper gastrointestinal ulcers (9 patients); pancreatitis and hyperamylasemia (5 patients); massive ileus (29); fistulas and abscesses (4); bowel infraction (3); small bowel obstruction (2); gangrenous cholecystitis (2); diffuse esophagitis (2); spontaneous perforation of the sigmoid colon, producing fever, chills and feculent drainage from the transplantation lesion (1); and pneumatosis cystoides intestinales (3). Six patients had no clinical or laboratory findings suggesting gastrointestinal complications; radiological examinations detected the problem. The extremely high mortality rate among patients suffering from gastrointestinal complications following renal transplantation suggest immediate diagnosis and therapy as a preventive measure. When steroids or immunosuppressive therapy mask clinical symptoms of abdominal disease, radiography may be the prime diagnostic method.

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GENERAL

Parasitology

9379 CHAGASIC MEGAESOPHAGUS: SIMILARITY TO ACHALASIA BY MANOMETRICS, RADIOGRAPHY, AND RESPONSE TO PNEUMATIC DILATION. *(E.)* Raizman, R. E.; Neva, F. A.; Eckert, R. J.; Duffy, P. A.; Lipshutz, W. H. (Lab. Parasitic Diseases, Natl. Inst. Health, Bethesda, Md. 20014). *Am. J. Dig. Dis.* 20(9):882-888, 1975.

The clinical, cineradiographic, and manometric findings before and after pneumatic dilation in a 54-yr-old woman with Chagas' disease and symptomatic megaesophagus were reported. The patient presented with complaints of dysphagia, regurgitation of undigested food, and substernal discomfort upon swallowing. Initial cineradiographic examination revealed a dilated esophagus (5 cm), a prominent air fluid level at the aortic arch, and absence of peristalsis. The dilated esophagus was tapered distally at the gastroesophageal junction. Endoscopic evaluation revealed the free passage of the endoscope into the stomach; no lesions of the stomach were noted. Manometric studies prior to pneumatic dilation indicated an elevated lower esophageal sphincter (LES) pressure of 42.6 mm Hg (normal, 16.4 mm Hg), impaired LES relaxation upon deglutition of 51.7% of resting LES pressure (normal, 100%), and the absence of peristalsis of the entire esophagus. Bethanechol chloride (40 µg/kg, s.c.) produced spontaneous high-peaked esophageal waves, an elevated base-line esophageal tension, and an increase in LES pressure from 35.5 to 85.5 mm Hg. Pneumatic dilation was performed with a pneumatic dilator positioned so that the midpoint of the radiopaque balloon was placed at the diaphragmatic hiatus; the balloon was inflated for two min with 15 psi pressure. Manometric evaluation 24 hr after pneumatic dilation revealed a decrease in LES pressure to 8.3 mm Hg. The percent relaxation remained abnormal at 46.8% and the absence of esophageal peristalsis persisted. Cineradiographic evaluation at two and four weeks posttreatment showed free passage of barium from the esophagus to the stomach. Peristalsis remained impaired, but no tapering of the gastroesophageal junction was noted. Ten weeks after dilation, the patient reported considerable symptomatic improvement. These results suggest that the common pathway of chagasic megaesophagus and achalasia involves denervated esophageal smooth muscle, and that pneumatic dilation is useful in the treatment of symptomatic chagasic megaesophagus.

9380 HEMATOLOGICAL AND IMMUNOLOGICAL RESPONSES TO THE TAPEWORM Hymenolepis diminuta IN MAN. *(E.)* Turton, J. A.; Williamson, J. R.; Harris, W. G. (Laboratory Animals Center, Carshalton, Surrey, England). *Tropenmed. Parasitol.* 26(2):196-200, 1975.

Self-infections with *Hymenolepis diminuta* were carried out to study the hematological and immunological responses of man to tapeworm. Initially, two preliminary experiments were undertaken. In the first, 30 cysticercoids dissected from the beetle, *Tribolium confusum*, were ingested, and in the second, 100 cysts were taken 22 days later. After one year, a third exposure period of 47 days was studied; 200 cysts were ingested on each of five occasions, and followed by niclosamide 24 days after the first day of infection. Blood samples were taken before, during and post infection. RBC and total leukocyte counts were taken by Coulter counter, and PVC by microhematocrit. Leukocyte differentiation was performed by May-Grunwald-Giemsa stains and the plasma viscosity was measured. The IgG and IgM titer levels were measured by fluorescent antibody technique using monospecific anti-human fluorescein-labeled conjugates. Serum glutamate pyruvate transaminase and glutamic oxaloacetate transaminase levels were also determined. No significant changes in erythrocyte values, leukocyte differentiation, calorie intake, or weight change were observed in the three experiments. The third infection caused a pronounced elevation of the eosinophilia count (500/cm^2-1,600/cm^2) after 24 days. Plasma viscosity also increased from 1.60 cP to 1.74 after 20 days. IgG titer rose from 1:20 preinfection to 1:320 after 21 days. There was a definite but low increase in IgM titer to 1:20. There was no effect on serum glutamate pyruvate transaminase or glutamate oxaloacetate transaminase activities. Niclosamide was palatable with no side effects. The presence of specific IgM and IgG indicated an active infection, whereas IgG alone indicated only past exposure. Circulating IgE was not detected. There was no evidence of tissue damage.

9381 QUANTITATIVE DETERMINATION OF SPECIFIC IgE ANTIBODIES TO SCHISTOSOME ANTIGENS AND SERUM IgE LEVELS IN PATIENTS WITH SCHISTOSOMIASIS (S. mansoni OR S. haematobium). *(E.)* Dessaint, J. P.; Capron, M.; Bout, D.; Capron, A. (Pasteur Inst., Lille, France). *Clin. Exp. Immunol.* 20(3):427-436, 1975.

An immunosorbent technique was developed, and used to investigate immunoglobulin E (IgE) antibody response to schistosome infection, and its relation to overall serum IgE concentration, in patients with schistosomiasis and in persons with urinary bilharziasis. Samples of blood from two groups of patients were studied: 1) 156 patients with *Schistosoma mansoni* schistosomiasis; and 2) 21 patients with urinary bilharziasis. IgE levels of those in the first group were increased in 77.5%, 21.8% having concentrations over 5000 IU/ml. IgG levels were also elevated in 68.5%. No significant difference was observed in IgE concentration between patients with asymptomatic, intestinal or hepatosplenic bilharziasis. Significantly elevated IgE antibody levels were demonstrated in 24 of 34 patients. No correlation was observed with the clinical course of the infection or serological findings. Levels of IgE antibodies, however, correlated with overall serum IgE. Specific IgE antibodies were also demonstrated in 11 of 21 individuals with urinary bilharziasis. It is concluded that the significance of raised IgE levels requires further clarification, even though the presence of living parasites is a necessary requirement for IgE antibody production, as confirmed by the observation of a significant decrease of both IgE antibody and overall IgE levels after treatment.

9382 GUT PARASITES: ALTERED DEVELOPMENT CAUSED BY CHANGING THE HOST FROM ORAL TO PARENTERAL NUTRITION [abstract]. *(E.)* Castro, G. A.; Johnson, L. R.; Copeland, E. M.; Dudrick, S. J. (Univ. Texas Med. Sch., Houston, Texas). *Gastroenterology* 68(4):870, 1975.

9383 INTESTINAL ANISAKIASIS. FIRST CASE REPORT FROM NORTH AMERICA. *(E.)* Pinkus, G. S.; Coolidge, C.; Little, M. D. (Harvard Medical Sch., Boston, Mass. 02115). *Am. J. Med.* 59(1):114-120, 1975.

9384 A SURVEY OF INTESTINAL PARASITISM IN A COMMUNITY ON THE PAN AMERICAN HIGHWAY ROUTE IN EASTERN PANAMA (SUMMARY). *(Sp.)* Cutting, J. W. (Laboratorio Gorgas Memorial, Panama, Panama). *Bol. Of Sanit. Panam.* 79(1):30-36,

9385 CASE REPORT OF AN EARLY GASTRIC CARCINOMA WITH EGGS OF Schistosoma japonicum. *(Jpn.)* Shibata, H.; Morimatsu, M.; Hayashida, T.; Tanaka, Y. (2nd Dept. Pathology, Kurume Univ. School Medicine, Kurume, Japan). *Gan No Rinsho* 21(5):349-353, 1975.

9386 HYDATID DISEASE OF THE LIVER. STUDY OF 60 CONFIRMED CASES. PART I. CLINICAL, BIOCHEMICAL AND RADIOLOGICAL MANIFESTATIONS. *(Sp.)* Garcia Alvarez, J.; Reverte Cejudo, D.; Solis Herruzo, J. A.; Pena, P. (Hospital Clinico de San Carlos, Spain). *Rev. Clin. Esp.* 135(3):255-262, 1974.

9387 PARTICULARITIES OF PARASITIC LIVER CIRRHOSIS IN GUINEA PIGS IN EXPERIMENTAL OPISTHORCHOSIS. *(Rus.)* Glumov, V. Ya.; Glumova, V. A. (Dept. of Pathological Anatomy, Semipalatinsk Medical Inst., USSR). *Med. Parazitol. (Mosk.)* 43(3):289-293, 1974.

9388 FUNCTIONAL STATUS OF THE INTESTINE IN HYMENOLEPIDOSIS. *(Rus.)* Kramar, V. S.; Kedryavtseva, N. F.; Bykhovskaya, A. N.; Abidaeva, L. I.; Glebova, A. A. (Scientific Res. Laboratory of Proctology, Kuybyshev Medical Inst., USSR). *Med. Parazitol. (Mosk.)* 43(3):293-296, 1974.

9389 AMEBIASIS AND INCIDENCE OF Entamoeba histolytica CARRIERS IN AN ENDEMIC FOCUS IN THE ARMENIAN SSR. *(Rus.)* Sarkisyan, M. A.; Voskanyan, K. M.; Melkonyan, L. M. (A. B. Aleksanyan Inst. of Epidemiology, Virology and Medical Parasitology, Ministry of Public Health of the Armenian SSR, USSR). *Med. Parazitol. (Mosk.)* 43(6):650-653, 1974.

9390 EXPERIMENTAL STUDY OF THE NEW ANTIHELMINTHIC DRUG, JONITE. *(Rus.)* Chernyaeva, A. I. (E. I. Martsinovskiy Inst. of Medical Parasitology and Tropical Diseases, Ministry of Public Health of the USSR, Moscow, USSR). *Med. Parazitol. (Mosk.)* 43(3):311-314, 1974.

9391 CURRENT PROBLEMS IN THE TREATMENT OF HELMINTHIASIS. *(Rus.)* Ozeretskovskaia, N. N. (E. I. Martsinovskii Inst. Medical Parasitology Tropical Medicine, Moscow, USSR). *Med. Parazitol. (Mosk.)* 46 (3):271-276, 1975.

9392 COMPARISON OF THE EFFECTS OF ANTIHELMINTHICS OF THE QUATERNARY AMMONIUM SALT TYPE ON BILE SECRETION AND THE CHEMICAL COMPOSITION OF THE BILE. *(Rus.)* Lychko, N. D. (E. I. Martsinovskii Medical Parasitology Tropical Medicine, Moscow, USSR). *Med. Parazitol. (Mosk.)* 46(3):307-310, 1975.

See also, 8103, 8448, 8955, 9032, 9033, 9042, 9043, 9052, 9292.

GENERAL

Regional Enteritis

9393 CROHN'S DISEASE OF THE APPENDIX PRESENTING AS ACUTE APPENDICITIS. REPORT OF 3 CASES WITH A REVIEW OF THE LITERATURE. *(E.)* Threatt, B.; Appelman, H. (Dept. Radiology, Univ. Michigan Hosp., Ann Arbor, Mich.). *Radiology* 110(2):313-317, 1974.

Three cases of Crohn's disease of the appendix are reported. A 21-yr-old white male presented with a six-month history of dull, vague, intermittent right lower quadrant pain which was relieved by defecation. The clinical and radiographic diagnosis was an appendiceal abscess. Exploratory celiotomy revealed a large mass surrounding the cecum in the region of the appendix, and the cecum and terminal ileum were removed *en bloc*. The appendiceal mucosa was ulcerated and the appendiceal wall was thickened by transmural inflammation extending into the serosa, subserosa, and the muscularis propria of the ileum and cecum; there was no mucosal involvement of the ileum or cecum. Granulomas were present in the wall of the appendix and in the regional lymph nodes.

The patient has remained asymptomatic during the three yr following intestinal resection. A 20-yr-old white female presented with a one-wk history of dull, nonradiating right lower quadrant pain relieved only by the knee-chest position. Spontaneous remission occurred, followed three wk later by recurrence with increased severity and nausea. Again, the clinical and radiographic findings suggested a diagnosis of appendiceal abscess. A right colectomy and distal ileal resection were performed. The appendiceal mucosa was extensively ulcerated with no involvement of the mucosa of the terminal ileum or cecum. The inflammatory reaction was identical to that in the first case. The patient has remained asymptomatic 34 months following surgery. A 26-yr-old white female presented with persistent, severe, diffuse abdominal pain of 3.5 wk duration. Laparotomy revealed a chronically inflamed appendix embedded within the cecal tip and adherent to the greater omentum, cecum, and terminal ileum. An appendectomy was performed. The proximally thickened appendix showed all microscopic features of Crohn's disease except granulomas. In this case, the appendiceal-cecal junction, which formed the resection margin, was involved. The patient has remained asymptomatic ten months following surgery. Although rare, Crohn's disease of the appendix should be considered in young patients who present with an acute abdomen and a radiographically demonstrable mass about the cecum and/or appendix.

9394 EXPERIMENTAL ANIMAL STUDIES OF THE ETIOLOGY AND PATHOGENESIS OF CROHN'S DISEASE. *(E.)*

Cave, D. R.; Mitchell, D. N.; Brooke, B. N. (St. George's Hosp., London SW 17, England). *Gastroenterology* 69(3):618-624, 1975.

The etiology and pathogenesis of Crohn's disease were studied in 52 New Zealand White rabbits. The animals were inoculated intramurally into the intestine with a 100-μ filtrate of fresh ileum or colon homogenate or with 100-μ filtrate that was subsequently passed through a 0.2-μ filter. The homogenate was derived from six patients with histologically confirmed Crohn's disease, five patients with no evidence of inflammatory bowel disease, or was isotonic saline, or normal rabbit mesenteric lymph node tissue. Other animals were injected intraileally or i.v. with passage homogenates prepared from the cecum or regional lymph nodes of rabbits inoculated 12 to 36 wk previously with the Crohn's tissue filtrates. The rabbits inoculated with the Crohn's tissue homogenates failed to thrive, showing a significant reduction in weight 6, 12, and 14 wk after inoculation compared with the control-injected animals. Of the 19 rabbits receiving the Crohn's homogenates, mucosal ulcerations, ileal thickening, and abscess formation were seen in eight animals and granulomatous changes evolved in nine. No significant macroscopic abnormalities or granulomatous changes were present in any of the animals inoculated with normal ileum or colon homogenates. Successful first passage was achieved from 6 of 11 rabbits; ileal thickening and cecal skip lesions were seen in 5 of 11 rabbits injected with these passage homogenates. Positive microscopic changes were also observed in four rabbits and equivocal changes were seen in two others injected with these homogenates. The results indicate that the transmissible agent or agents responsible for the development of Crohn's disease must approximate the size of a virus or be capable of being deformed to pass through a 0.2-μ filter.

9395 THE VALUE OF COLONOSCOPY IN THE DIAGNOSIS OF CROHN'S DISEASE. *(E.)*

Geboes, K.; Vantrappen, G. (Univ. Hosp. St. Rafael, Univ. Leuven, Leuven, Belgium). *Gastrointest. Endosc.* 22(1):18-23, 1975.

Fifty-nine patients with Crohn's disease were prospectively examined by colonoscopy and biopsy with a view to etablishing endoscopic, radiographic, and histologic correlations. In 73% of the patients the entire colon could be viewed and biopsied; no complications occurred in any of the patients. Colonoscopy enabled a histologic diagnosis to be made in 14 (24%) patients, based on the presence of typical sarcoid granulomas. In 10% of the patients this confirmed an earlier diagnosis, and in 14% the colonoscopic biopsy yielded the only histological evidence of the disease. Biopsy of micro-ulcerations most often yielded a definitive histologic diagnosis. Ten of the 16 biopsies in micro-ulcerations contained typical granulomas; eight of the 14 diagnostic biopsies were taken from such lesions. Granulomas were also found around the edge of macro-ulcerations in eight of 72 specimens. Biopsies from other lesions seldom yielded more than nonspecific inflammatory reaction. Endoscopically normal mucosa showed nonspecific inflammatory reactions in 40% of biopsy specimens. Colonoscopy proved superior to radiology in defining mucosal abnormalities such as ulcerations and nodular or polypoid lesions and for recognizing the segmental character of colonic lesions. Haustral changes and diminished distensibility were better appreciated radiologically, particularly in the right colon. Although radiography and proctosigmoidoscopy remain valuable diagnostic tools, this study demonstrates the extent to which colonoscopy can be used in evaluating patients with Crohn's disease.

9396 RESULTS OF SURGERY FOR CROHN'S DISEASE IN THE GLASGOW REGION, 1961-70. *(E.)*

Young, S.; Smith, I. S.; O'Connor, J.; Bell, J. R.; Gillespie G. (Stobhill General Hosp., Glasgow, Scotland). *Br. J. Surg.* 62(7):528-534, 1975.

Surgical management of regional enteritis in the Glasgow region was studied with particular reference to mortality, morbidity and the posibility of recurrence. The study group included 283 patients with a clinical radiological and histological diagnosis of regional enteritis. These included 155 with involvement in the small intestine alone, 81 with ileocolitis, and 47 wit large intestinal involvement alone. Indications for initial surgery included: obstruction (27%); fistula (9%); severe alimentary symptoms (44%); suspected appendicitis (11%); and failed medical treatment (9%). Of the 175 patients with recurrence, indications for subsequent admission included: obstruction (23%);

fistula (23%); alimentary symptoms (44%); abscess (4%); and anemia combined with weight loss (6%). Resection was followed by an overall recurrence rate of 33%, but in patients with large intestinal disease alone, the recurrence was 18%. Laparotomy, biopsy and bypass procedures were followed by a recurrence rate of 70%. Postoperative complications occurred as perforation in four patients and fistula formation in 30 (11%); anastomotic leakage occurred in ten patients. There were 21 postoperative deaths in the entire series, and later, seven additional related and ten unrelated deaths. At the end of the study period, 47% of the patients had disease confined to the small intestine, 39% had ileocolitis, and 13% had large intestinal disease alone. It is suggested that the timing of operation, rather than the feasibility of surgery, be evaluated.

9397 ILEORECTAL ANASTOMOSIS FOR CROHN'S DISEASE OF THE COLON. *(Eng.)* Lefton, H. B.; Farmer, R. G.; Fazio, V. (Cleveland Clinic Foundation, 9500 Euclid Ave., Cleveland, Ohio 44106). *Gastroenterology* 69(3):612-617, 1975.

The postoperative course of 35 women and 31 men (mean age 29.2 yr) who underwent ileorectal anastomosis for Crohn's disease at the Cleveland Clinic between 1957 and 1972 was evaluated. The average follow-up was six yr. Twenty-six patients showed an excellent clinical response to surgery with no evidence of recurrent disease. The lack of recurrence was confirmed by sigmoidoscopy and roentgenography. Some patients in this group were receiving no medication, while others received occasional symptomatic treatment for diarrhea and/or prophylactic adrenocorticotropic hormone. A total of 12 patients showed a satisfactory clinical response to surgery. These patients showed a mild to moderate recurrence of symptoms such as rectal bleeding, increased number of daily bowel movements, and abdominal pain; the symptoms responded to adrenocorticotropic hormone or steroids. There were no signs of small intestinal involvement and none of the patients required additional surgery. Twenty-one patients required either revision of their anastomosis or ileostomy after their initial operation. These patients suffered abdominal pain, diarrhea, and rectal bleeding which could not be controlled by therapy. The disease recurred within an average of 3.5 yr; the most common procedure performed for these patients was a loop-end ileostomy with excision of the rectal segment. Presently, 17 of these patients have ileostomies and four have functioning ileorectal anastomoses. Seven patients with diversionary ileostomies and ileorectal anastomoses never had their ileostomies closed; no anastomotic leaks developed. Preoperative rectal hyperemia was present in eight patients, toxic megacolon developed in 11 cases, and nine patients had internal or perianal fistulae during the course of their illness. Five patients died, all from causes not directly related to the ileorectal anastomosis. The amount of ileal resection, providing it was less than 50 cm, had no apparent effect on the prognosis for ileorectal anastomosis, and steroid or adrenocorticotropin therapy had no apparent long range influence. The best surgical results were achieved in the youngest patients. The data indicate that ileorectal anastomosis is a safe and useful procedure for selected patients with Crohn's colitis.

9398 HUMORAL IMMUNE SYSTEM ACTIVITY IN INFLAMMATORY BOWEL DISEASE. *(E.)* Teisberg, P.; Gjone, E. (Univ. Hosp., Rikshospitalet, Oslo 1, Norway). *Scand. J. Gastroenterol.* 10(5):545-549, 1975.

The metabolism of complement components in inflammatory bowel disease was studied. Twenty-five patients with ulcerative colitis and 29 patients with Crohn's disease were diagnosed and evaluated. Venous blood samples were drawn from the 54 patients, while 50 blood samples from 30 healthy individuals served as controls. Activation products of C3 were demonstrated by crossed immunoelectrophoresis in agarose gel; complement components C4, GBG, and C3 were determined by the radial immunodiffusion method. *In vivo* activation was demonstrated in 56% of the patients with ulcerative colitis; the GAG fragment, formed as an activation product of GBG, was found in 78.5% of those patients, plus one of the others. Complement system involvement was positively correlated with disease activity and extent of intestinal involvement: 51% of the patients with Crohn's disease had circulating activation products of C3, while 60% of those also had GAG. The presence of these activation products again correlated with activity of the disease, but not with extent of affected bowel area. In eight patients, serial studies performed on two to four blood samples collected over a two-yr period confirmed the conclusion. In view of the similar complement findings of ulcerative colitis and Crohn's disease, complement activation seems a pathogenic factor in Crohn's disease, or it may reflect heterogeneity in the mechanisms of tissue injury in ulcerative colitis. The normal serum levels of C4, GBG, and C3 found suggest increased synthesis compensating for a high catabolic rate of C3 and GBG.

9399 FECAL RADIOIODIDE EXCRETION FOLLOWING INTRAVENOUS INJECTION OF ^{131}I-ALBUMIN AND ^{125}I-IMMUNOGLOBULIN G IN CHRONIC INFLAMMATORY BOWEL DISEASE. AN AID TO TOPOGRAPHIC DIAGNOSIS. *(E.)* Jarnum, S.; Jensen, K. B. (Rigshospitalet, Blegdamsvej 9, 2100 Copenhagen, Demark). *Gastroenterology* 68(6):1433-1444, 1975.

Radiographic abnormalities were studied in 27 patients with regional enteritis and 21 with ulcerative colitis. Albumin turnover was measured after i.v. injection of ^{131}I-labeled human serum albumin (30-50 µCi); immunoglobulin G (IgG) studies utilized ^{125}I-labeled IgG (10-20 µCi). Intestinal protein loss was also determined by administration of ^{59}Fe-iron dextran simultaneously with the albumin and IgG. A highly significant correlation was found between fecal iron clearance and the fractional catabolic rate of albumin in patients with ulcerative colitis. Serum albumin was negatively correlated with the fractional catabolic rate of albumin, and the latter was highly and positively correlated with the fractional catabolic rate of IgG. There was a marked correlation between fecal iodide excretion from labeled albumin and fecal iodide excretion from labeled IgG. Fecal excretion of both ^{131}I and ^{125}I was positively correlated with fecal iron clearance. In patients with regional enteritis, there was a high correlation between fecal iron clearance and the fractional catabolic rate of albumin. There was no correlation between serum albumin and the fractional catabolic rate of albumin. However, the latter was significantly correlated with the fractional catabolic rate of IgG. Radioiodide excretion from both labeled albumin and IgG was highly correlated. Fecal iodide excretion from labeled IgG exceeded that of iodide excretion from labeled albumin in patients with small intestinal lesions. There was a positive and significant correlation between diarrhea and fecal iodide excretion in both ulcerative colitis and regional enteritis, but there was no correlation between fecal mass and intestinal protein loss. It is suggested that simultaneous studies with radioiodine-labeled albumin and IgG in protein-losing chronic inflammatory bowel disease may be useful in identifying the site of the lesion in cases where radiography shows no lesions or lesions of a doubtful nature.

9400 SERUM IMMUNOGLOBULIN M CONCENTRATIONS FOLLOWING BOWEL RESECTION IN CHRONIC INFLAMMATORY BOWEL DISEASE.

(E.) Soltis, R. D.; Wilson, I. D. (Univ. Minnesota Medical Sch., Minneapolis, Minn. 55455). *Gastroenterology* 69(4): 885-892, 1975.

The nature of immunoglobulin changes occurring after surgery was investigated in chronic inflammatory bowel disease (CIBD) patients undergoing bowel resections and in controls undergoing various other intra-abdominal operations. Serum was obtained before surgery and at varying postoperative intervals from 20 patients with CIBD and from 11 control subjects. Immunoglobulins A, G, and M were quantitated by immunodiffusion in agar gel. IgM was isolated by Sephadex gel filtration and subsequently purified by immunoadsorption with glutaraldehyde-treated anti-IgM. Total serum proteins, serum protein electrophoresis, and sucrose density gradient ultracentrifugation of IgM were performed using standard techniques. Serum IgM concentrations increased significantly, by as much as 935%, between postoperative days 8 to 15 in both CIBD patients and controls; the increases were significantly higher in CIBD patients. While serum IgG and IgA concentrations decreased immediately after surgery in CIBD patients, serum IgA concentrations also rose slightly between days 8 to 15. All the serum IgM appeared confined to the 19 S fraction of the sucrose gradients. No relation between changes in serum IgM concentrations and anticolon antibody titers was found; further studies showed no difference in the binding of normal or chronic ulcerative colitis (CUC) IgM to the normal or CUC colon. In general, increased postoperative titers were also noted against *Escherichia coli* and *Bacteriodes fragilis*, against blood group antibodies A and B, and against heterophil antibodies. No correlation of IgM concentrations with transfusions, operative time, type of anesthetic, or corticosteroid treatment was found. In contrast to prior observations, the studies demonstrate a later and nonspecific rise in serum IgM concentrations following surgery.

9401 CORRELATION BETWEEN REGIONAL ENTEROCOLITIS AND CUTANEOUS POLYARTERITIS NODOSA: TWO CASE REPORTS AND REVIEW OF THE LITERATURE.

(E.) Solley, G. O.; Winkelmann, R. K.; Rovelstad, R. A. (Mayo Clinic, 200 First St., S.W., Rochester, Minn. 55901). *Gastroenterology* 69(1):235-239, 1975.

Case reports are presented for two women with regional enteritis and cutaneous polyarteritis nodosa. Surgery in the first patient at age 20 revealed regional ileitis and perforation of the ileum, and she was treated with salicylazosulfapyridine. S.c. nodules first appeared less than 1 yr later on the ankles, and prednisone therapy did not alter the course of the disease. Livedo reticularis and s.c. nodules were noted on both ankles and thighs on admission 1 yr later. Laboratory studies showed iron deficiency anemia, and moderate elevation of serum immunoglobulin (Ig) A and G levels. Skin biopsy showed a panarteritis involving all layers of the blood vessel walls of the large muscular vessels in the s.c. tissue. Treatment with sulfapyridine produced complete remission of the skin lesions. Recurrence over a 2-yr period indicated surgery. A portion of the terminal ileum, the cecum, a portion of the ascending colon and a segment of the sigmoid colon were resected. Improvement of the skin lesions was noted postoperatively. At 46 yr of age, the second patient developed s.c. nodules on the ankles and on the front of her legs. Less than 2 yr later, regional enteritis was diagnosed, with secondary skin lesions, but right hemicolectomy with resection of the terminal ileum failed to improve the skin disease. A nearly symmetrical, tender, papulonodular skin eruption with scarring and livedo reticularis was seen 2 yr after this. Treatment with sulfapyridine induced marked improvement by the end of 5 months. It is concluded that cutaneous polyarteritis nodosa is occasionally manifested in the spectrum of skin disorders of regional enterocolitis.

9402 ANKYLOSING SPONDYLITIS AND REGIONAL ENTERITIS.

(E.) Mueller, C. E.; Seeger, J. F.; Martel, W. (Univ. Michigan Medical Center, Ann Arbor, Mich.). *Radiology* 112(3):579-581, 1974.

A retrospective review of the radiographs of 200 randomly selected cases of regional enteritis or granulomatous enterocolitis seen at a particular hospital between 1955 and 1971 was undertaken to determine the incidence of sacroiliac arthritis and ankylosing spondylitis. Unequivocally abnormal joints were found in ten men and ten women, six of whom (3 men and 3 women) had a clinical diagnosis of ankylosing spondylitis. Fourteen of the 20 patients were aged 20 to 40 yr, the remaining six being in the 40- to 60-yr age group. The colon was involved in only two cases, but became involved following small bowel surgery in four others; none of the group with overt ankylosing spondylitis had colonic involvement, although two had surgical and histologic verification of bowel disease. The median duration of bowel disease prior to the earliest radiographic demonstration of sacroiliac arthritis was slightly less than five yr. Back symptoms preceded recognition of bowel disease in all but one of the six cases of clinical ankylosing spondylitis. One patient with a 16-yr history of psoriasis also had migratory arthralgias in the large joints and arthritis of the hands; five other patients had peripheral joint symptoms. None of the patients had a history of Reiter's disease or uveitis. The data show no correlation between spondylitis and involvement of the colon by regional enteritis. The prevalence of ankylosing spondylitis in patients with regional enteritis is comparable to that seen in patients with chronic ulcerative colitis. Radiologists should be aware of the association and should specifically look for evidence of spondylitis in patients with either of these diseases.

9403 A CONTROLLED EVALUATION OF INTRAVENOUS ADRENOCORTICOTROPIC HORMONE AND HYDROCORTISONE IN THE TREATMENT OF ACUTE COLITIS. *(E.)* Kaplan, H. P.; Portnoy, B.; Binder, H. J.; Amatruda, T.; Spiro, H. (Dept. Internal Medicine, Yale Univ., New Haven, Conn., 06510). *Gastroenterology* 69(1):91-95, 1975.

A prospective double-blind clinical trial was undertaken in patients with regional enteritis or ulcerative colitis to compare the therapeutic effects of hydrocortisone and adrenocorticotropic hormone (ACTH) in pharmacologically equivalent doses. Steroid therapy was warranted in all patients. Both hydrocortisone (300 mg) and ACTH (40 U) were administered by continuous 8-hr i.v. infusion. Of the 22 patients with acute colitis, seven were receiving steroids at the time of entry into the study. Severe disease was present in 18, and four had moderate disease; 15 of 22 improved with therapy. There was no significant difference in improvement between the ACTH- (57%) and hydrocortisone-treated (73%) groups. Mean plasma cortisol concentration for the ACTH-treated group was 80 mg/100 ml, compared to 123 mg/100 ml for the hydrocortisone-treated group. No difference was observed between those patients who responded to therapy and those who did not. Prior treatment with steroids did not prevent adrenal response to ACTH. The mean urinary excretion of 17-hydroxycorticoid was 35.1 mg/g of creatinine in those who responded to ACTH, in contrast to 59.9 mg/g in those who did not respond. Similar results were obtained in the group treated with hydrocortisone. ACTH produced a two- to fourfold higher 17-ketosteroid excretion than hydrocortisone. There was no significant difference in delay in onset of clinical improvement between the two groups. It is concluded that both drugs administered i.v. are equally effective in treating acute colitis in previously untreated patients, and that response to ACTH is rapid and there is no significant therapeutic lag or lag in plasma cortisol levels. Further, therapeutic response or failure cannot be related to differences in systemic steroid levels, and prior treatment with steroids may indicate hydrocortisone rather than ACTH treatment.

9404 COLONOSCOPIC MUCOSAL BIOPSIES IN CHRONIC INFLAMMATORY BOWEL DISEASE (CIBD): SPECIFICITY OF PATHOLOGIC DIAGNOSIS [abstract]. *(E.)* Hogan, W. J.; Hensley, G. T.; Miller, W. N.; Geneen, J. E. (Med. Coll. Wisconsin, Milwaukee, Wis.). *Gastroenterology* 68(4):1031, 1975.

9405 CELL-MEDIATED IMMUNITY IN CROHN'S DISEASE [abstract]. *(E.)* Meuwissen, S. G. M.; Schellekens, P. T. A.; Huismans, L.; Huis, B.; deWilde, F. A.; Swelm-Langeveld, J. B.; Tytgat, G. N. (Dept. Gastroenterol., Univ. Amsterdam, Amsterdam, Holland). *Gastroenterology* 68(4):954, 1975.

9406 ENDOSCOPIC FEATURES OF CROHN'S DISEASE OF THE STOMACH AND DUODENUM [abstract]. *(E.)* Danzi, J. T.; Farmer, R. G.; Sullivan, B. H.; Rankin, G. B. (Cleveland Clin. Found., Cleveland, Ohio). *Gastroenterology* 68(4):1024, 1975.

9407 SERUM LYSOZYME IN THE DIAGNOSIS AND FOLLOW-UP OF PATIENTS WITH CROHN'S DISEASE [abstract]. *(E.)* Falchuk, K. R.; Perrotto, J. L. (Massachusetts Gen. Hosp., Boston, Mass.). *Gastroenterology* 68(4):890, 1975.

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DHEW Publication No. (NIH) 76-66

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GASTROENTEROLOGY

ABSTRACTS
AND
CITATIONS

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NATIONAL INSTITUTE OF ARTHRITIS, METABOLISM, AND DIGESTIVE DISEASES

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service
National Institutes of Health

VOLUME 9, 1975

INDEX ISSUE

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Volume 9 Index Issue, 1975

GASTROENTEROLOGY ABSTRACTS AND CITATIONS

A monthly publication of the
National Institute of Arthritis, Metabolism, and Digestive Diseases

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by
The Franklin Institute Research Laboratories
Science Information Services
Biomedical Section
Bruce H. Kleinstein, Ph.D., Technical Editor
for the
National Institute of Arthritis, Metabolism, and Digestive Diseases
pursuant to Contract Number N01-AM-4-2204

with the PHS, USDHEW

DHEW Publication No. (NIH) 76-66

PREFACE

GASTROENTEROLOGY ABSTRACTS and CITATIONS is a publication of the National Institute of Arthritis, Metabolism and Digestive Diseases. This specialized information medium has been initiated to fill an existing great need in the field of gastroenterology and to assist the Institute in meeting its obligations to foster and support laboratory and clinical research into the nature, causes, and therapy of diseases of the gastrointestinal tract. Publication GASTROENTEROLOGY ABSTRACTS and CITATIONS makes available citations of all current papers relevant to this field from medical journals published throughout the world. Approximately one-third of the citations dealing with the major aspects of gastroenterology have accompanying abstracts.

The issuing of GASTROENTEROLOGY ABSTRACTS and CITATIONS under the auspices of the National Institute of Arthritis, Metabolism, and Digestive Diseases will provide a much needed current awareness tool to scientists and will facilitate greater integration of research and clinical efforts in this field. The number and great diversity of publications in the area of gastroenterology makes it imperative that an appropriate service be available to investigators and practitioners so that they may be apprised of progress with a minimum of delay. Our aim is to provide the readers with a readily systematized compilation of current published work. The publication will provide the greatest usefulness if these interested investigators will contribute their ideas and comments for consideration whenever possible.

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